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AERODYNAMIC DATA ON LARGE SEMISPAN TILTING WING WITH 0.6-DIAMETER CHORD, SINGLE SLOTTED FLAP, AND SINGLE PROPELLER ROTATING UP AT TIP

by Marvin P. Fink, Robert G. Mitchell, and Lucy C. White

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SUMMARY

An investigation has been made in the Langley full-scale tunnel to determine the longitudinal aerodynamic characteristics of a large-scale semispan V/STOL tilt-wing configuration having a single propeller with propeller rotation such that the blades rotated upward at the wing tip and downward near the root. The wing had a ratio of chord to propeller diameter of 0.6, a single slotted flap, an aspect ratio of 4.05 (2.025 for the semispan), a taper ratio of 1.0, and an NACA 4415 airfoil section.

The data have not been analyzed in detail but have been examined to observe general trends. A few such trends predominate. The basic leading-edge configuration had practically no stall on that portion of the wing immersed in the propeller slipstream at angles well above those corresponding to the peak of the lift curve for the high thrust conditions corresponding to operation in the STOL range of flight; and, in general, the stall on the wing center section coincides with the angle of attack for maximum lift for the low thrust coefficients. The use of a leading-edge slat on the outboard wing section had virtually no effect on the aerodynamic characteristics of the wing since there was no stalling on the outboard section of the wing without the slat. The use of an inboard slat had no effect on the tip section. Full-span slat reduced stall on the inboard section of the wing and increased both the angle of attack and drag at maximum lift, but did not increase the value of maximum lift. Neither the flow in the slipstream nor the force data was improved by the Krueger flap, but the Krueger flap did improve the flow on the part of the wing center section inboard of the propeller slipstream for the higher thrust coefficients.

INTRODUCTION

Most of the aerodynamic research that has been done on the tilt-wing propeller-driven V/STOL configuration in the past has been of an exploratory character and has been obtained with small-scale models. The interest in this type of airplane has now become so substantial, however, that there is a need for large-scale systematic aerodynamic design data for this type of airplane. A program has therefore been inaugurated at the Langley Research Center to

The model configuration for the present tests had a 68-inch-diameter propeller having the characteristics shown in figure 2(b). The propeller location was such that the propeller tip extended out to the wing tip. The direction of propeller rotation was up at the wing tip and down at the root. This mode of rotation is sometimes referred to as "with the tip vortex." The propeller thrust was measured by a strain-gage balance which was a part of the propeller shaft. The output was fed through sliprings to an indicating instrument. The required values of thrust for each $C_{T,s}$ were set by the operator by changing the speed of the drive motor. The blade angle at the 0.75R station of the propeller was held constant at 17° throughout the investigation. The thrust axis was inclined upward 4° from the chord line of the wing to correspond approximately to the zero-lift line of the airfoil section.

The airfoil used was the NACA 4415 section with a 41-inch chord. This chord length gave a ratio of wing chord to propeller diameter of 0.6. The reference area of the wing based on a semispan of 83 inches was 23.62 square feet, and did not include the area of the tip fairing.

The model had a 40-percent-chord single slotted flap which had a deflection range from 0° to 50°. Figure 3 shows the flap in the 50° deflected position and also shows the slot geometry.

The two leading-edge flow-control devices shown in figure 3 were investigated in combination with the flap on this model. These devices were a Krueger flap and a leading-edge slat. The Krueger flap, which in the retracted position in actual use would form the bottom contour of the nose section, was constructed of sheetmetal and was hinged at the 0.017c station. Its deflection could be varied from 30° to 90° in increments of 10°. However, previous investigations covering a large range of deflections showed that a 50° deflection proved near optimum for this wing; therefore, for these tests, only the 50° deflection was used. In one test the Krueger flap was faired straight from the end of the flap to the leading edge of the basic airfoil nose as indicated in figure 3. For the leading-edge slat, two deflection angles (20° to 30°) and two slot gaps (0.0244c and 0.0122c) were originally provided. Test data presented in reference 1 showed little change in the results with variation of slat angle and gap; consequently, the present tests were made only with a 20° deflection and an 0.244c gap. The section designated as the inboard section extended from the wing root to the nacelle and that section designated as the outboard section extended from the nacelle to the wing-tip fairing.

TESTS, RESULTS, AND DISCUSSION

The tests were made for a range of single slotted flap deflections and a combination of leading-edge flow-control devices. The specific configuration tested, together with a list of tables and figures in which data for each may be found, are given in the following table:

Leading-edge configuration	Flap deflection, deg	Table	Figure
Basic leading edge	$\delta_f = 0$	1	4
	$\delta_f = 20$	2	5
	$\delta_f = 40$	3	6
	$\delta_f = 50$	4	7
Leading-edge slat:			
Outboard section; $\delta_s = 20^\circ$	$\delta_f = 0$	5	8
Outboard section; $\delta_s = 20^\circ$	$\delta_f = 20$	6	9
Outboard section; $\delta_s = 20^\circ$	$\delta_f = 40$	7	10
Outboard section; $\delta_s = 20^\circ$	$\delta_f = 50$	8	11
Inboard section; $\delta_s = 20^\circ$	$\delta_f = 40$	9	12
Inboard section; $\delta_s = 20^\circ$	$\delta_f = 50$	10	13
Full span; $\delta_s = 20^\circ$	$\delta_f = 40$	11	14
Full span; $\delta_s = 20^\circ$	$\delta_f = 50$	12	15
Krueger flap:			
Outboard section; $\delta_K = 50^\circ$	$\delta_f = 50$	13	16
Full span; $\delta_K = 50^\circ$	$\delta_f = 50$	14	17
Inboard section (faired to leading edge); $\delta_K = 50^\circ$	$\delta_f = 50$	15	18

The tests were made over a range of thrust coefficient from 0 to 1.0, and for any given test the thrust coefficient was held constant over the angle-of-attack range by adjusting the propeller speed to give the required thrust at each angle of attack. The angle-of-attack range for the tests was approximately from the angle required for zero lift to that required to stall the wing or develop a drag-lift ratio of about 0.3, whichever was lower, except for $C_{T,s} = 1.0$ (the static thrust case) where the angle-of-attack range was 0° to 90°. The test Reynolds number, based on the wing chord length and the velocity of the propeller slipstream, was about 2.8×10^6 for thrust coefficients from 1.00 to 0.30. For the $C_{T,s} = 0$ condition where the thrust was held at zero, the Reynolds number was about 2.3×10^6.

No tunnel-wall corrections have been applied to the data since surveys and analysis had indicated that there would be no significant correction as explained in reference 1. The data presented have not been analyzed in detail, but have been examined to observe general trends. A few such trends predominate.

For all the various leading-edge configurations, the trailing-edge flap was stalled over most of its area for deflections of 40° and 50° (but not 20°) at angles up to approximately that required for maximum lift. For angles of attack above that for maximum lift, however, the stalling on the flap disappeared. Flap deflections of 40° and 50° were found to give almost exactly the same lift

and drag characteristics, and they both gave higher lift and drag than that for the 20° deflection.

For the basic leading edge, the wing-flow photographs show that there is practically no stall on that portion of the wing immersed in the propeller slipstream at angles of attack well above that corresponding to the peak of the lift curve for the high thrust conditions corresponding to operation in the STOL range of flight ($C_{T,s}$ = 0.060 to 1.00) and that, in general, the stall on the wing center section coincides with the angle of attack for maximum lift for the low thrust coefficients ($C_{T,s}$ = 0 and 0.30). Similar stall characteristics were also noted in the results of reference 1 in which the same model was tested with an extended Fowler type of trailing-edge flap with the same mode of propeller rotation. The result of tests reported in reference 2 where only the propeller rotation was different (down at the tip) from the present tests the tufts showed stall starting at the wing root and progressing smoothly outboard onto the portion of the wing in the propeller slipstream inboard of the nacelle. Evidently, the direction of propeller rotation which has the effect of increasing the angle of attack of the portion of the wing behind "upgoing" blade causes this change in stall characteristics. That portion of the center section which is not in the slipstream does not appear to be affected by the direction of propeller rotation.

The use of the leading-edge slat on the portion of the wing outboard of the nacelle had virtually no effect on either the lift and drag or wing-flow characteristics - evidently because there was no significant wing stalling on the outboard section of the wing which might be affected by the slat. The inboard slat, however, delayed the stall of the center section (inboard of the slipstream) for all conditions tested; and it caused significant increases in the angle of attack for maximum lift and the drag at maximum lift at low thrust coefficients ($C_{T,s}$ = 0 to 0.60) where the center-section lift was an appreciable part of the total lift. The inboard slat did not, however, significantly increase the value of the maximum lift coefficient. The sharp break in the lift curve at stall for the basic leading edge at low thrust coefficients was reduced to a gradual decline by the inboard slat. The full-span slat gave almost exactly the same results as the inboard slat alone, as would be expected, since the outboard slat was not effective.

None of the Krueger flap configurations gave any appreciable improvement in the flow on that portion of the wing in the propeller slipstream or in the force data over that of the basic leading-edge configuration. The inboard portion of the Krueger flap did, however, improve the flow on the portion of the wing inboard of the slipstream for thrust coefficients from 0.95 to 0.60, but for the low thrust conditions from 0.30 to 0, the Krueger flap did not have this effect since no stall occurred in this area for angles of attack up to maximum lift.

CONCLUSIONS

An investigation to obtain large-scale aerodynamic data and flow studies on a semispan wing for an angle-of-attack range from -20° to 90° for thrust coefficients from 0 to 1.0 indicates the following conclusions:

1. The basic leading-edge configuration had practically no stall on that portion of the wing immersed in the propeller slipstream at angles well above those corresponding to the peak of the lift curve for the high thrust conditions corresponding to operation in the STOL flight range; and, in general, the stall on the wing center section coincides with the angle of attack for maximum lift for the low thrust coefficients.

2. A leading-edge slat on the outboard wing section had virtually no effect on the aerodynamic characteristics. The slat on the inboard wing section had almost the same characteristics as the full-span slat. A full-span slat reduced stall on the inboard section of the wing and increased both the angle of attack and drag at maximum lift but did not increase the value at maximum lift.

3. Neither the flow in the slipstream nor the force data was improved by the Krueger flap, but the Krueger flap did improve the flow on the part of the wing center section inboard of the propeller slipstream for the higher thrust coefficients.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Station, Hampton, Va., July 1, 1964.

REFERENCES

1. Fink, Marvin P., Mitchell, Robert G., and White, Lucy C.: Aerodynamic Data on a Large Semispan Tilting Wing With 0.6-Diameter Chord, Fowler Flap, and Single Propeller Rotating Up at Tip. NASA TN D-2180, 1964.

2. Fink, Marvin P., Mitchell, Robert G., and White, Lucy C.: Aerodynamic Data on a Large Semispan Tilting Wing With 0.6-Diameter Chord, Single-Slotted Flap, and Single Propeller Rotating Down at Tip. NASA TN D-2412, 1964.

TABLE I.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 0^\circ$

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 1.00			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.111	-1.043	0.009
5	.206	-1.034	.013
10	.311	-1.004	.017
15	.392	-.980	.013
20	.479	-.941	.013
25	------	------	------
30	.621	-.846	.007
35	------	------	------
40	.757	-.723	0
45	------	------	------
50	.850	-.602	-.002
55	------	------	------
60	.934	-.454	-.023
65	------	------	------
70	.996	-.270	-.031
75	------	------	------
80	1.015	-.180	-.035
90	1.031	.101	-.025
$C_{T,s}$ = 0.95			
-20	-0.369	-0.924	-0.051
-15	-.302	-.954	-.041
-10	-.115	-.989	-.019
-5	.009	-.991	-.005
0	.139	-.983	.004
5	.263	-.966	.017
10	.389	-.933	.018
15	.496	-.884	.028
20	.606	-.824	.033
25	.694	-.761	.033
30	.777	-.690	.034
35	.848	-.606	.032
40	.916	-.516	.035
45	.960	-.431	.033
50	1.000	-.343	.026
55	1.044	-.238	.035
60	1.084	-.123	.046
65	1.106	-.004	.053
70	1.118	.115	.050
75	1.114	.241	.058
80	1.095	.344	.058
$C_{T,s}$ = 0.90			
-20	-0.421	-0.869	-0.059
-15	-.283	-.911	-.052
-10	-.137	-.931	-.028
-5	.002	-.930	-.012
0	.156	-.925	.005
5	.296	-.899	.017
10	.440	-.865	.028
15	.566	-.815	.036
20	.678	-.740	.037
25	.785	-.664	.034
30	.873	-.574	.041
35	.959	-.474	.041
40	1.027	-.364	.040
45	1.072	-.261	.036
50	1.105	-.158	.033
55	1.127	-.048	.026
60	1.136	.058	.024
65	1.135	.178	.029
70	1.119	.263	.020
75	1.088	.349	.020
$C_{T,s}$ = 0.80			
-20	-0.482	-0.724	-0.083
-15	-.353	-.782	-.073
-10	-.190	-.822	-.061
-5	-.020	-.822	-.044
0	.162	-.821	-.017
5	.329	-.793	-.002
10	.508	-.748	.030
15	.673	-.692	.041
20	.835	-.613	.047
25	.900	-.517	.044
30	1.005	-.394	.035
35	1.097	-.279	.033
40	1.172	-.173	.028
45	1.224	-.014	.025
50	1.252	.118	.024
55	1.259	.227	.022
60	1.247	.333	.025
65	1.209	.403	.029
$C_{T,s}$ = 0.60			
-20	-0.583	-0.456	-0.109
-15	-.512	-.550	-.117
-10	-.269	-.585	-.084
-5	-.061	-.595	-.055
0	.176	-.587	-.030
5	.400	-.561	-.010
10	.654	-.508	.031
15	.850	-.443	.050
20	1.033	-.350	.056
25	1.074	-.248	.050
30	1.171	-.118	.045
35	1.234	.030	.017
40	1.276	.182	0
45	1.297	.327	0
50	1.286	.440	0
55	1.202	.523	-.001
$C_{T,s}$ = 0.30			
-20	-0.741	-0.132	-0.149
-15	-.647	-.250	-.154
-10	-.367	-.274	-.123
-5	-.092	-.296	-.083
0	.185	-.295	-.046
5	.458	-.267	-.024
10	.754	-.202	.023
15	1.010	-.126	.049
20	1.243	-.020	.059
25	1.307	.107	.038
30	1.356	.252	.016
35	1.357	.430	-.019
40	1.266	.565	-.049
$C_{T,s}$ = 0			
-20	-0.729	0.210	-0.111
-15	-.739	.095	-.183
-10	-.403	.024	-.136
-5	-.111	.026	-.091
0	.228	.030	-.041
5	.543	.045	-.009
10	.879	.114	.028
15	1.168	.189	.049
20	1.443	.296	.067
25	1.448	.449	.010
30	1.407	.592	-.024

TABLE 2.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 20^\circ$

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 1.00$			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.285	-0.990	-0.069
5	.379	-.969	-.078
10	.476	-.930	-.073
15	.549	-.886	-.075
20	.628	-.834	-.081
25	------	------	------
30	.763	-.712	-.088
35	------	------	------
40	.858	-.584	-.095
45	------	------	------
50	.930	-.444	-.102
55	------	------	------
60	.990	-.264	-.103
65	------	------	------
70	1.018	-.099	-.120
75	------	------	------
80	1.021	.085	-.120
90	.995	.275	-.123
$C_{T,s} = 0.95$			
-20	-0.130	-0.964	-0.121
-15	-.005	-.980	-.113
-10	.128	-.977	-.097
-5	.248	-.963	-.092
0	.379	-.938	-.083
5	.494	-.890	-.075
10	.616	-.840	-.076
15	.711	-.777	-.070
20	.803	-.693	-.063
25	.869	-.618	-.063
30	.945	-.529	-.064
35	.983	-.451	-.061
40	1.023	-.353	-.058
45	1.056	-.266	-.058
50	1.085	-.165	-.050
55	1.111	-.052	-.039
60	1.120	.049	-.029
65	1.118	.132	-.008
70	1.120	.240	-.004
75	1.106	.355	.005
$C_{T,s} = 0.90$			
-20	-0.157	-0.891	-0.141
-15	-.010	-.913	-.134
-10	.144	-.921	-.112
-5	.281	-.901	-.108
0	.433	-.877	-.091
5	.570	-.829	-.080
10	.717	-.766	-.079
15	.808	-.691	-.071
20	.905	-.596	-.076
25	.983	-.503	-.071
30	1.065	-.391	-.070
35	1.111	-.290	-.066
40	1.148	-.182	-.066
45	1.163	-.080	-.063
50	1.168	.019	-.061
55	1.174	.132	-.063
60	1.162	.222	-.053
65	1.147	.321	-.044
70	1.111	.376	-.039

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 0.80$			
-20	-0.190	-0.768	-0.164
-15	-.027	-.802	-.162
-10	.154	-.802	-.140
-5	.324	-.794	-.129
0	.510	-.761	-.107
5	.688	-.705	-.100
10	.873	-.633	-.092
15	1.028	-.531	-.089
20	1.092	-.430	-.084
25	1.157	-.308	-.087
30	1.233	-.182	-.084
35	1.278	-.057	-.078
40	1.314	.070	-.083
45	1.313	.184	-.072
50	1.315	.301	-.070
55	1.285	.383	-.054
60	1.246	.458	-.043
$C_{T,s} = 0.60$			
-20	-0.278	-0.506	-0.189
-15	-.091	-.572	-.206
-10	.173	-.583	-.195
-5	.382	-.557	-.160
0	.647	-.522	-.141
5	.881	-.454	-.132
10	1.135	-.360	-.116
15	1.347	-.249	-.123
20	1.513	-.111	-.110
25	1.434	.018	-.117
30	1.452	.158	-.115
35	1.444	.287	-.120
40	1.424	.412	-.114
45	1.366	.496	-.087
$C_{T,s} = 0.30$			
-20	-0.374	-0.167	-0.222
-15	-.299	-.241	-.265
-10	.164	-.268	-.221
-5	.449	-.252	-.202
0	.781	-.199	-.182
5	1.084	-.110	-.173
10	1.417	-.007	-.163
15	1.701	.117	-.151
20	1.929	.277	-.145
25	1.742	.422	-.173
30	1.688	.568	-.180
$C_{T,s} = 0$			
-20	-0.386	0.151	-0.247
-15	-.172	.057	-.314
-10	.192	.055	-.273
-5	.552	.071	-.250
0	.925	.142	-.224
5	1.286	.211	-.203
10	1.678	.332	-.199
15	1.972	.481	-.187
20	2.299	.643	-.185
25	2.064	.799	-.241
30	1.902	.960	-.249

TABLE 3.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 40^\circ$

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 1.00$			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.377	-0.903	-0.134
5	.470	-.871	-.131
10	.559	-.821	-.131
15	.612	-.778	-.134
20	.670	-.719	-.135
25	------	------	------
30	.776	-.596	-.147
35	------	------	------
40	.851	-.468	-.149
45	------	------	------
50	.920	-.325	-.157
55	------	------	------
60	.956	-.155	-.168
65	------	------	------
70	.973	.030	-.175
75	------	------	------
80	.935	.186	-.169
90	.899	.374	-.166
$C_{T,s} = 0.95$			
-20	0.013	-0.899	-0.184
-15	.131	-.907	-.175
-10	.272	-.894	-.173
-5	.389	-.866	-.166
0	.515	-.821	-.167
5	.631	-.765	-.162
10	.748	-.691	-.167
15	.822	-.623	-.161
20	.903	-.534	-.158
25	.966	-.434	-.165
30	1.032	-.343	-.158
35	1.076	-.235	-.160
40	1.109	-.120	-.151
45	1.121	-.037	-.136
50	1.126	.056	-.129
55	1.116	.144	-.119
60	1.108	.225	-.108
65	1.091	.303	-.086
70	1.072	.327	-.051
$C_{T,s} = 0.90$			
-20	-0.020	-0.831	-0.202
-15	.143	-.847	-.201
-10	.293	-.828	-.186
-5	.441	-.806	-.183
0	.605	-.750	-.175
5	.734	-.690	-.169
10	.876	-.597	-.184
15	.950	-.514	-.169
20	1.046	-.406	-.178
25	1.126	-.291	-.177
30	1.194	-.173	-.179
35	1.223	-.058	-.170
40	1.220	.041	-.164
45	1.210	.136	-.155
50	1.179	.211	-.149
55	1.156	.290	-.133
60	1.129	.353	-.120

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 0.80$			
-20	-0.064	-0.710	-0.230
-15	.113	-.723	-.213
-10	.336	-.716	-.218
-5	.518	-.685	-.208
0	.717	-.624	-.197
5	.913	-.545	-.203
10	1.103	-.438	-.204
15	1.244	-.327	-.206
20	1.306	-.209	-.203
25	1.350	-.066	-.210
30	1.366	.064	-.209
35	1.365	.177	-.194
40	1.346	.272	-.172
45	1.339	.372	-.144
50	1.303	.441	-.119
$C_{T,s} = 0.60$			
-20	-0.103	-0.455	-0.261
-15	.126	-.478	-.262
-10	.398	-.472	-.256
-5	.630	-.425	-.245
0	.896	-.365	-.238
5	1.174	-.275	-.244
10	1.437	-.144	-.250
15	1.627	-.022	-.247
20	1.772	.127	-.244
25	1.641	.294	-.258
30	1.533	.399	-.224
35	1.476	.484	-.192
$C_{T,s} = 0.30$			
-20	-0.172	-0.139	-0.285
-15	.136	-.175	-.332
-10	.422	-.163	-.312
-5	.748	-.122	-.288
0	1.109	-.040	-.293
5	1.474	.072	-.304
10	1.819	.204	-.301
15	2.036	.359	-.302
20	2.257	.533	-.285
25	1.963	.715	-.305
30	1.683	.781	-.262
$C_{T,s} = 0$			
-20	-0.273	0.200	-0.300
-15	.134	.135	-.374
-10	.509	.161	-.359
-5	.874	.192	-.346
0	1.283	.284	-.344
5	1.721	.400	-.350
10	2.112	.566	-.352
15	2.429	.729	-.347
20	2.754	.922	-.353
25	2.221	1.106	-.392
30	1.729	1.113	-.321

TABLE 4.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 50^\circ$

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 1.00$		
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.434	-0.860	-0.142
5	.511	-.818	-.146
10	.585	-.769	-.148
15	.646	-.719	-.151
20	.696	-.669	-.151
25	------	------	------
30	.795	-.541	-.161
35	------	------	------
40	.851	-.417	-.169
45	------	------	------
50	.924	-.262	-.168
55	------	------	------
60	.944	-.101	-.176
65	------	------	------
70	.944	.070	-.187
75	------	------	------
80	.920	.232	-.189
90	.870	.399	-.191
	$C_{T,s} = 0.95$		
-20	0.091	-0.877	-0.190
-15	.200	-.877	-.184
-10	.332	-.854	-.179
-5	.448	-.824	-.169
0	.571	-.773	-.174
5	.681	-.712	-.168
10	.789	-.638	-.175
15	.860	-.563	-.170
20	.952	-.460	-.194
25	1.009	-.367	-.178
30	1.061	-.252	-.174
35	1.111	-.137	-.171
40	1.124	-.038	-.166
45	1.127	.046	-.155
50	1.124	.129	-.142
55	1.107	.209	-.128
60	1.089	.286	-.112
65	1.067	.341	-.090
	$C_{T,s} = 0.90$		
-20	0.092	-0.809	-0.211
-15	.242	-.808	-.206
-10	.391	-.789	-.195
-5	.530	-.749	-.195
0	.678	-.691	-.186
5	.804	-.620	-.185
10	.931	-.534	-.183
15	1.012	-.447	-.188
20	1.103	-.320	-.192
25	1.168	-.217	-.190
30	1.219	-.093	-.186
35	1.240	.021	-.181
40	1.237	.122	-.167
45	1.207	.192	-.159
50	1.159	.268	-.146
55	1.126	.327	-.132

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 0.80$		
-20	0.038	-0.676	-0.235
-15	.243	-.688	-.241
-10	.432	-.667	-.224
-5	.618	-.625	-.222
0	.829	-.554	-.220
5	1.003	-.468	-.222
10	1.168	-.355	-.221
15	1.312	-.241	-.226
20	1.323	-.124	-.219
25	1.366	.024	-.225
30	1.372	.143	-.219
35	1.350	.236	-.198
40	1.319	.323	-.175
45	1.302	.402	-.144
	$C_{T,s} = 0.60$		
-20	-0.010	-0.432	-0.272
-15	.251	-.444	-.281
-10	.539	-.415	-.278
-5	.772	-.366	-.265
0	1.037	-.296	-.257
5	1.302	-.190	-.270
10	1.536	-.059	-.264
15	1.714	.076	-.264
20	1.790	.236	-.253
25	1.627	.385	-.256
30	1.487	.454	-.221
	$C_{T,s} = 0.30$		
-20	-0.060	-0.109	-0.303
-15	.291	-.131	-.335
-10	.643	-.115	-.328
-5	.949	-.051	-.326
0	1.283	.034	-.310
5	1.591	.148	-.312
10	1.911	.309	-.295
15	2.130	.461	-.274
20	2.049	.691	-.337
25	1.817	.768	-.290
	$C_{T,s} = 0$		
-20	-0.145	0.197	-0.324
-15	.342	.168	-.385
-10	.774	.214	-.394
-5	1.142	.273	-.376
0	1.536	.365	-.364
5	1.904	.499	-.363
10	2.247	.652	-.357
15	2.496	.813	-.330
20	2.716	1.008	-.318
25	2.008	1.133	-.355
30	1.599	1.145	-.286

TABLE 5.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 0^\circ$, $\delta_s = 20^\circ$ (OUTBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 1.00			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.110	-1.022	-0.009
5	.213	-1.020	-.004
10	.321	-.994	.004
15	.404	-.965	0
20	.480	-.923	-.002
25	------	------	------
30	.639	-.831	-.008
35	------	------	------
40	.750	-.721	-.022
45	------	------	------
50	.855	-.584	-.026
55	------	------	------
60	.931	-.451	-.047
65	------	------	------
70	.999	-.275	-.055
75	------	------	------
80	1.022	-.075	-.051
90	1.022	.103	-.046
$C_{T,s}$ = 0.95			
-20	-0.350	-0.915	-0.062
-15	-.237	-.953	-.047
-10	-.103	-.976	-.028
-5	.020	-.983	-.018
0	.154	-.973	-.002
5	.273	-.956	.006
10	.395	-.918	.009
15	.503	-.878	.020
20	.607	-.814	.023
25	.697	-.749	.024
30	.783	-.672	.026
35	.849	-.590	.028
40	.910	-.506	.026
45	.959	-.415	.018
50	.997	-.326	.026
55	1.032	-.229	.020
60	1.077	-.109	.041
65	1.098	.002	.050
70	1.115	.127	.050
75	1.115	.256	.057
80	1.096	.352	.062
$C_{T,s}$ = 0.90			
-20	-0.403	-0.844	-0.073
-15	-.251	-.894	-.068
-10	-.124	-.921	-.043
-5	.010	-.927	-.036
0	.165	-.921	-.009
5	.305	-.895	.003
10	.452	-.861	.017
15	.576	-.811	.025
20	.688	-.732	.024
25	.785	-.655	.028
30	.884	-.561	.033
35	.967	-.465	.032
40	1.028	-.359	.036
45	1.072	-.254	.033
50	1.109	-.150	.029
55	1.125	-.045	.024
60	1.140	.070	.021
65	1.140	.181	.022
70	1.126	.275	.025
75	1.101	.355	.031

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 0.80			
-20	-0.478	-0.693	-0.098
-15	-.340	-.763	-.094
-10	-.166	-.801	-.067
-5	.002	-.818	-.047
0	.193	-.806	-.019
5	.360	-.781	-.005
10	.534	-.737	.021
15	.691	-.678	.027
20	.803	-.597	.029
25	.910	-.497	.020
30	1.016	-.379	.028
35	1.098	-.263	.026
40	1.169	-.132	.022
45	1.217	-.010	.025
50	1.249	.121	.017
55	1.257	.242	.027
60	1.253	.358	.029
65	1.224	.460	.033
$C_{T,s}$ = 0.60			
-20	-0.595	-0.415	-0.120
-15	-.472	-.503	-.123
-10	-.271	-.559	-.099
-5	-.041	-.574	-.070
0	.191	-.574	-.036
5	.411	-.556	-.008
10	.656	-.496	.012
15	.864	-.434	.032
20	1.032	-.338	.041
25	1.082	-.230	.038
30	1.185	-.090	.031
35	1.235	.051	.013
40	1.297	.198	.003
45	1.345	.343	.005
50	1.358	.473	.005
55	1.323	.574	.008
$C_{T,s}$ = 0.30			
-20	-0.706	-0.080	-0.146
-15	-.626	-.189	-.147
-10	-.358	-.237	-.127
-5	-.078	-.272	-.098
0	.197	-.266	-.061
5	.473	-.246	-.020
10	.762	-.187	.014
15	1.007	-.106	.028
20	1.219	.003	.046
25	1.263	.116	.029
30	1.362	.268	.013
35	1.405	.438	-.014
40	1.402	.580	-.014
45	1.350	.667	-.015
50	1.212	.712	-.033
$C_{T,s}$ = 0			
-20	-0.645	0.304	-0.093
-15	-.635	.174	-.140
-10	-.377	.100	-.111
-5	-.109	.052	-.092
0	.209	.047	-.066
5	.548	.060	-.028
10	.875	.115	.011
15	1.149	.205	.029
20	1.392	.329	.052
25	1.468	.468	.012
30	1.467	.626	-.026
35	1.437	.781	-.052
40	1.260	.854	-.075

TABLE 6.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 20°$, $\delta_s = 20°$ (OUTBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 1.00$		
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.293	-0.991	-0.079
5	.383	-.966	-.084
10	.467	-.922	-.084
15	.544	-.878	-.085
20	.619	-.822	-.086
25	------	------	------
30	.740	-.704	-.094
35	------	------	------
40	.852	-.574	-.094
45	------	------	------
50	.922	-.427	-.110
55	------	------	------
60	.980	-.256	-.114
65	------	------	------
70	1.016	-.092	-.125
75	------	------	------
80	1.009	.083	-.134
90	.972	.259	-.134
	$C_{T,s} = 0.95$		
-20	-0.149	-0.939	-0.130
-15	-.027	-.960	-.125
-10	.104	-.960	-.111
-5	.228	-.946	-.106
0	.357	-.918	-.099
5	.477	-.884	-.089
10	.601	-.827	-.093
15	.694	-.768	-.090
20	.778	-.694	-.082
25	.861	-.615	-.080
30	.915	-.523	-.079
35	.968	-.434	-.073
40	1.011	-.342	-.076
45	1.055	-.250	-.072
50	1.077	-.149	-.070
55	1.100	-.046	-.055
60	1.108	.050	-.040
65	1.111	.135	-.018
70	1.106	.239	-.005
75	1.105	.361	.004
	$C_{T,s} = 0.90$		
-20	-0.171	-0.869	-0.144
-15	-.025	-.897	-.146
-10	.131	-.902	-.146
-5	.269	-.890	-.114
0	.423	-.863	-.106
5	.559	-.813	-.097
10	.706	-.751	-.091
15	.791	-.681	-.087
20	.895	-.585	-.085
25	.973	-.489	-.081
30	1.046	-.393	-.081
35	1.104	-.283	-.075
40	1.137	-.177	-.068
45	1.144	-.075	-.065
50	1.162	.024	-.059
55	1.166	.137	-.056
60	1.158	.228	-.052
65	1.142	.327	-.053
70	1.114	.403	-.038

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 0.80$		
-20	-0.222	-0.744	-0.172
-15	-.057	-.782	-.168
-10	.132	-.796	-.151
-5	.301	-.783	-.139
0	.490	-.749	-.119
5	.669	-.695	-.115
10	.856	-.622	-.105
15	1.013	-.533	-.103
20	1.091	-.423	-.095
25	1.144	-.302	-.094
30	1.215	-.176	-.089
35	1.268	-.059	-.086
40	1.284	.065	-.079
45	1.315	.187	-.075
50	1.304	.301	-.063
55	1.285	.407	-.055
60	1.257	.488	-.046
	$C_{T,s} = 0.60$		
-20	-0.362	-0.457	-0.189
-15	-.195	-.517	-.195
-10	.089	-.551	-.183
-5	.346	-.544	-.170
0	.603	-.514	-.153
5	.860	-.450	-.138
10	1.126	-.353	-.130
15	1.333	-.248	-.127
20	1.539	-.111	-.114
25	1.415	.012	-.117
30	1.440	.166	-.115
35	1.425	.282	-.109
40	1.420	.398	-.098
45	1.414	.518	-.082
	$C_{T,s} = 0.30$		
-20	-0.461	-0.102	-0.152
-15	-.320	-.190	-.194
-10	-.009	-.236	-.192
-5	.337	-.225	-.202
0	.730	-.181	-.193
5	1.071	-.109	-.188
10	1.390	.004	-.173
15	1.671	.117	-.158
20	1.942	.273	-.146
25	1.811	.432	-.170
30	1.657	.574	-.172
	$C_{T,s} = 0$		
-20	-0.458	0.232	-0.189
-15	-.334	.139	-.211
-10	-.006	.120	-.213
-5	.371	.085	-.219
0	.857	.128	-.226
5	1.259	.212	-.216
10	1.657	.330	-.205
15	1.982	.464	-.194
20	2.293	.632	-.175
25	2.049	.801	-.212
30	1.791	.946	-.208

TABLE 7.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 40^\circ$, $\delta_s = 20^\circ$ (OUTBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 1.00			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.379	-0.910	-0.141
5	.465	-.871	-.141
10	.540	-.830	-.142
15	.599	-.783	-.142
20	.666	-.719	-.149
25	------	------	------
30	.780	-.590	-.154
35	------	------	------
40	.872	-.446	-.155
45	------	------	------
50	.919	-.308	-.178
55	------	------	------
60	.959	-.135	-.176
65	------	------	------
70	.967	.041	-.183
75	------	------	------
80	.944	.217	-.179
90	.897	.363	-.177
$C_{T,s}$ = 0.95			
-20	-0.002	-0.898	-0.175
-15	.115	-.905	-.165
-10	.256	-.890	-.164
-5	.376	-.867	-.163
0	.494	-.830	-.156
5	.613	-.773	-.158
10	.724	-.696	-.150
15	.820	-.650	-.154
20	.904	-.530	-.153
25	.984	-.430	-.161
30	1.045	-.332	-.151
35	1.084	-.241	-.154
40	1.107	-.134	-.144
45	1.129	-.035	-.133
50	1.117	.037	-.118
55	1.110	.119	-.105
60	1.102	.197	-.092
65	1.087	.257	-.067
70	1.081	.316	-.029
$C_{T,s}$ = 0.90			
-20	-0.060	-0.827	-0.184
-15	.116	-.838	-.181
-10	.283	-.832	-.178
-5	.427	-.800	-.174
0	.589	-.754	-.167
5	.725	-.692	-.172
10	.848	-.611	-.169
15	.946	-.526	-.169
20	1.050	-.398	-.174
25	1.128	-.296	-.175
30	1.180	-.186	-.165
35	1.214	-.078	-.158
40	1.215	.027	-.147
45	1.201	.113	-.133
50	1.167	.191	-.130
55	1.147	.275	-.122
60	1.118	.340	-.100
65	1.089	.416	-.092

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 0.80			
-20	-0.162	-0.685	-0.192
-15	.070	-.722	-.207
-10	.278	-.720	-.205
-5	.461	-.693	-.195
0	.683	-.634	-.200
5	.899	-.549	-.209
10	1.108	-.438	-.214
15	1.246	-.333	-.214
20	1.277	-.221	-.203
25	1.342	-.068	-.211
30	1.354	.058	-.202
35	1.356	.151	-.186
40	1.343	.252	-.163
45	1.314	.340	-.144
50	1.297	.433	-.118
55	1.253	.515	-.102
60	1.215	.568	-.074
$C_{T,s}$ = 0.60			
-20	-0.293	-0.430	-0.210
-15	-.006	-.474	-.234
-10	.308	-.479	-.241
-5	.552	-.444	-.235
0	.841	-.388	-.231
5	1.165	-.289	-.255
10	1.435	-.154	-.257
15	1.617	-.028	-.247
20	1.758	.117	-.237
25	1.620	.276	-.254
30	1.547	.384	-.218
35	1.474	.458	-.183
40	1.416	.535	-.150
45	1.390	.617	-.133
50	1.340	.685	-.100
55	1.270	.721	-.060
$C_{T,s}$ = 0.30			
-20	-0.450	-0.072	-0.179
-15	-.103	-.148	-.249
-10	.273	-.158	-.266
-5	.639	-.128	-.280
0	1.058	-.041	-.289
5	1.446	.072	-.307
10	1.777	.213	-.301
15	2.042	.364	-.299
20	2.282	.547	-.285
25	1.978	.719	-.296
30	1.733	.794	-.264
$C_{T,s}$ = 0			
-20	-0.509	0.272	-0.171
-15	-.090	.197	-.283
-10	.317	.176	-.295
-5	.712	.188	-.307
0	1.231	.283	-.350
5	1.676	.407	-.375
10	2.143	.566	-.372
15	2.460	.752	-.357
20	2.743	.942	-.343
25	2.904	1.122	-.326
30	1.760	1.140	-.321
35	1.539	1.180	-.285

TABLE 8.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 50^{\circ}$, $\delta_s = 20^{\circ}$ (OUTBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 1.00			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.418	-0.860	-0.144
5	.496	-.825	-.145
10	.564	-.778	-.151
15	.630	-.727	-.158
20	.685	-.669	-.159
25	------	------	------
30	.791	-.551	-.159
35	------	------	------
40	.850	-.421	-.160
45	------	------	------
50	.914	-.271	-.171
55	------	------	------
60	.953	-.096	-.153
65	------	------	------
70	.949	.071	-.192
75	------	------	------
80	.910	.233	-.188
90	.866	.381	-.198
$C_{T,s}$ = 0.95			
-20	0.013	-0.863	-0.171
-15	.133	-.862	-.158
-10	.290	-.846	-.178
-5	.409	-.815	-.168
0	.546	-.774	-.174
5	.657	-.714	-.176
10	.763	-.641	-.172
15	.847	-.562	-.174
20	.936	-.454	-.178
25	1.000	-.359	-.178
30	1.058	-.254	-.174
35	1.095	-.143	-.177
40	1.124	-.031	-.172
45	1.124	.045	-.155
50	1.126	.125	-.141
55	1.105	.194	-.128
60	1.086	.263	-.110
65	1.062	.321	-.090
70	1.048	.341	-.048
$C_{T,s}$ = 0.90			
-20	-0.063	-0.796	-0.184
-15	.167	-.806	-.193
-10	.328	-.783	-.199
-5	.485	-.756	-.193
0	.639	-.693	-.200
5	.781	-.632	-.196
10	.900	-.540	-.193
15	.989	-.458	-.188
20	1.093	-.329	-.199
25	1.158	-.219	-.195
30	1.206	-.093	-.196
35	1.225	.009	-.187
40	1.230	.116	-.171
45	1.206	.193	-.150
50	1.165	.259	-.140
55	1.120	.310	-.129
60	1.092	.509	-.118

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 0.80			
-20	-0.054	-0.674	-0.217
-15	.179	-.685	-.222
-10	.386	-.669	-.219
-5	.582	-.630	-.223
0	.793	-.563	-.219
5	.981	-.474	-.227
10	1.172	-.360	-.234
15	1.295	-.244	-.233
20	1.304	-.117	-.224
25	1.356	.023	-.223
30	1.355	.137	-.212
35	1.327	.218	-.185
40	1.296	.307	-.168
45	1.279	.393	-.139
50	1.248	.470	-.121
$C_{T,s}$ = 0.60			
-20	-0.202	-0.404	-0.218
-15	.101	-.437	-.243
-10	.433	-.418	-.252
-5	.686	-.375	-.249
0	.980	-.307	-.252
5	1.252	-.202	-.272
10	1.502	-.064	-.263
15	1.688	.069	-.262
20	1.786	.235	-.248
25	1.575	.358	-.244
30	1.483	.441	-.206
$C_{T,s}$ = 0.30			
-20	-0.383	-0.066	-0.193
-15	.022	-.122	-.245
-10	.446	-.121	-.285
-5	.834	-.056	-.302
0	1.222	.044	-.305
5	1.564	.154	-.307
10	1.878	.302	-.311
15	2.092	.462	-.292
20	2.302	.626	-.288
25	1.862	.788	-.294
30	1.650	.860	-.249
$C_{T,s}$ = 0			
-20	-0.461	0.277	-0.182
-15	.107	.209	-.311
-10	.570	.221	-.339
-5	.974	.268	-.356
0	1.454	.363	-.371
5	1.845	.492	-.366
10	2.204	.652	-.341
15	2.485	.795	-.333
20	2.713	.989	-.321
25	2.012	1.135	-.330
30	1.674	1.194	-.288

TABLE 9.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 40^\circ$, $\delta_s = 20^\circ$ (INBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 1.00$		
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.296	-0.906	-0.097
5	.368	-.878	-.104
10	.458	-.839	-.100
15	.528	-.799	-.101
20	.588	-.749	-.104
25	------	------	------
30	.703	-.640	-.109
35	------	------	------
40	.805	-.525	-.104
45	------	------	------
50	.852	-.369	-.120
55	------	------	------
60	.920	-.221	-.130
65	------	------	------
70	.944	-.036	-.129
75	------	------	------
80	.949	.122	-.134
90	.904	.277	-.133
	$C_{T,s} = 0.95$		
-20	-0.116	-0.856	-0.140
-15	.002	-.873	-.131
-10	.124	-.878	-.120
-5	.249	-.863	-.117
0	.388	-.832	-.120
5	.489	-.804	-.112
10	.612	-.743	-.113
15	.710	-.680	-.111
20	.808	-.586	-.112
25	.889	-.497	-.111
30	.957	-.400	-.117
35	.993	-.317	-.120
40	1.017	-.238	-.111
45	1.054	-.120	-.112
50	1.064	-.028	-.110
55	1.082	.076	-.101
60	1.070	.150	-.097
65	1.116	.226	-.029
70	1.109	.280	-.009
75	1.086	.346	.012
	$C_{T,s} = 0.90$		
-20	-0.173	-0.782	-0.150
-15	-.047	-.800	-.137
-10	.122	-.816	-.134
-5	.282	-.803	-.129
0	.439	-.773	-.123
5	.575	-.726	-.122
10	.727	-.654	-.122
15	.844	-.572	-.121
20	.991	-.462	-.134
25	1.078	-.355	-.132
30	1.122	-.242	-.139
35	1.191	-.109	-.145
40	1.210	.006	-.144
45	1.199	.093	-.137
50	1.180	.178	-.127
55	1.159	.254	-.111
60	1.141	.313	-.090
65	1.110	.367	-.069

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 0.80$		
-20	-0.209	-0.648	-0.163
-15	-.087	-.687	-.143
-10	.072	-.701	-.139
-5	.306	-.688	-.142
0	.521	-.652	-.142
5	.740	-.583	-.146
10	.942	-.495	-.151
15	1.094	-.389	-.154
20	1.252	-.264	-.167
25	1.366	-.133	-.163
30	1.408	-.017	-.159
35	1.426	.104	-.158
40	1.408	.233	-.152
45	1.373	.335	-.140
50	1.320	.398	-.107
55	1.271	.473	-.087
	$C_{T,s} = 0.60$		
-20	-0.223	-0.365	-0.196
-15	-.083	-.419	-.184
-10	.062	-.449	-.172
-5	.301	-.444	-.169
0	.629	-.403	-.183
5	.973	-.321	-.205
10	1.328	-.188	-.233
15	1.553	-.068	-.224
20	1.697	.087	-.211
25	1.778	.230	-.201
30	1.805	.371	-.180
35	1.753	.482	-.158
40	1.713	.549	-.106
45	1.556	.629	-.092
	$C_{T,s} = 0.30$		
-20	-0.158	-0.026	-0.219
-15	-.059	-.093	-.211
-10	.102	-.114	-.192
-5	.379	-.115	-.215
0	.741	-.061	-.215
5	1.225	.036	-.264
10	1.663	.183	-.281
15	1.920	.336	-.277
20	2.163	.476	-.269
25	2.210	.729	-.294
30	2.173	.866	-.236
35	2.038	.908	-.179
	$C_{T,s} = 0$		
-20	-0.120	0.303	-0.233
-15	-.017	.253	-.227
-10	.136	.212	-.226
-5	.414	.203	-.227
0	.879	.260	-.257
5	1.482	.361	-.328
10	2.041	.565	-.359
15	2.403	.748	-.362
20	2.642	.948	-.342
25	2.610	1.148	-.340
30	2.533	1.270	-.294

TABLE 10.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 50^\circ$, $\delta_s = 20^\circ$ (INBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s}$ = 1.00		
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.314	-0.873	-0.112
5	.406	-.837	-.121
10	.476	-.805	-.118
15	.539	-.764	-.127
20	.594	-.719	-.114
25	------	------	------
30	.706	-.611	-.124
35	------	------	------
40	.792	-.485	-.129
45	------	------	------
50	.867	-.329	-.145
55	------	------	------
60	.915	-.161	-.160
65	------	------	------
70	.912	-.016	-.164
75	------	------	------
80	.900	.115	-.158
90	.858	.311	-.157
	$C_{T,s}$ = 0.95		
-20	-0.072	-0.848	-0.140
-15	.050	-.864	-.134
-10	.182	-.860	-.128
-5	.299	-.845	-.126
0	.415	-.809	-.119
5	.528	-.763	-.114
10	.653	-.694	-.123
15	.760	-.616	-.128
20	.866	-.517	-.134
25	.925	-.426	-.135
30	.975	-.339	-.136
35	1.029	-.238	-.137
40	1.048	-.134	-.130
45	1.071	-.034	-.131
50	1.055	.031	-.120
55	1.052	.109	-.114
60	1.089	.169	-.055
65	1.101	.231	-.024
70	1.104	.303	-.003
75	1.081	.341	.084
	$C_{T,s}$ = 0.90		
-20	-0.141	-0.760	-0.153
-15	-.005	-.784	-.147
-10	.169	-.789	-.143
-5	.318	-.775	-.140
0	.482	-.732	-.134
5	.622	-.678	-.135
10	.773	-.598	-.141
15	.892	-.513	-.143
20	1.013	-.388	-.157
25	1.104	-.274	-.158
30	1.125	-.179	-.156
35	1.180	-.048	-.155
40	1.196	.066	-.155
45	1.189	.153	-.147
50	1.158	.225	-.130
55	1.132	.279	-.109
60	1.109	.339	-.091

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s}$ = 0.80		
-20	-0.179	-0.623	-0.168
-15	-.049	-.662	-.159
-10	.147	-.671	-.159
-5	.350	-.651	-.162
0	.601	-.594	-.160
5	.811	-.524	-.169
10	1.018	-.415	-.177
15	1.171	-.309	-.179
20	1.338	-.164	-.186
25	1.427	-.038	-.182
30	1.475	.083	-.165
35	1.446	.199	-.166
40	1.406	.315	-.161
45	1.357	.400	-.139
50	1.296	.448	-.103
	$C_{T,s}$ = 0.60		
-20	-0.206	-0.340	-0.200
-15	-.041	-.395	-.192
-10	.170	-.409	-.195
-5	.412	-.395	-.196
0	.738	-.338	-.199
5	1.093	-.244	-.215
10	1.402	-.108	-.237
15	1.590	.017	-.232
20	1.747	.168	-.216
25	1.831	.318	-.194
30	1.836	.450	-.186
35	1.705	.508	-.138
40	1.654	.567	-.099
	$C_{T,s}$ = 0.30		
-20	-0.155	-0.005	-0.227
-15	-.012	-.057	-.226
-10	.225	-.086	-.237
-5	.537	-.058	-.244
0	.904	.004	-.244
5	1.387	.105	-.285
10	1.752	.271	-.282
15	1.989	.415	-.273
20	2.203	.612	-.267
25	2.240	.819	-.276
30	2.170	.909	-.221
35	1.892	.892	-.153
	$C_{T,s}$ = 0		
-20	-0.124	0.329	-0.238
-15	.009	.275	-.244
-10	.215	.241	-.241
-5	.627	.248	-.270
0	1.123	.314	-.287
5	1.687	.446	-.330
10	2.171	.646	-.365
15	2.437	.829	-.351
20	2.616	.998	-.308
25	2.519	1.216	-.297
30	2.226	1.232	-.238

TABLE 11.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 40^\circ$, $\delta_s = 20^\circ$ (FULL SPAN)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 1.00$			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.273	-0.890	-0.101
5	.356	-.875	-.107
10	.420	-.835	-.103
15	.496	-.795	-.097
20	.562	-.747	-.103
25	------	------	------
30	.680	-.646	-.113
35	------	------	------
40	.768	-.527	-.125
45	------	------	------
50	.850	-.389	-.124
55	------	------	------
60	.893	-.236	-.133
65	------	------	------
70	.928	.090	-.131
75	------	------	------
80	.921	.113	-.139
90	.890	.252	-.141
$C_{T,s} = 0.95$			
-20	-0.165	-0.844	-0.126
-15	-.031	-.863	-.122
-10	.104	-.869	-.116
-5	.237	-.856	-.117
0	.376	-.826	-.120
5	.487	-.786	-.115
10	.604	-.732	-.117
15	.718	-.664	-.118
20	.821	-.575	-.123
25	.906	-.475	-.129
30	.957	-.393	-.124
35	.982	-.315	-.120
40	1.015	-.230	-.118
45	1.040	-.128	-.112
50	1.058	-.032	-.107
55	1.061	.057	-.105
60	1.053	.120	-.091
65	1.112	.223	-.021
70	1.106	.287	-.004
$C_{T,s} = 0.90$			
-20	-0.249	-0.754	-0.129
-15	-.128	-.791	-.119
-10	.058	-.803	-.124
-5	.243	-.794	-.123
0	.415	-.769	-.119
5	.560	-.720	-.123
10	.715	-.648	-.127
15	.845	-.562	-.129
20	.971	-.454	-.135
25	1.066	-.350	-.138
30	1.109	-.244	-.146
35	1.187	-.106	-.148
40	1.195	-.007	-.142
45	1.187	.089	-.132
50	1.168	.176	-.119
55	1.145	.247	-.104
60	1.128	.310	-.083
65	1.094	.370	-.066

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 0.80$			
-20	-0.283	-0.623	-0.143
-15	-.181	-.670	-.123
-10	-.007	-.701	-.117
-5	.228	-.689	-.134
0	.476	-.649	-.139
5	.711	-.582	-.155
10	.924	-.494	-.153
15	1.099	-.387	-.166
20	1.259	-.255	-.171
25	1.379	-.126	-.172
30	1.449	.004	-.165
35	1.442	.119	-.155
40	1.426	.248	-.152
45	1.386	.358	-.134
50	1.340	.430	-.104
$C_{T,s} = 0.60$			
-20	-0.305	-0.343	-0.162
-15	-.208	-.398	-.151
-10	-.059	-.441	-.131
-5	.173	-.457	-.139
0	.569	-.402	-.169
5	.948	-.315	-.207
10	1.303	-.190	-.230
15	1.522	-.061	-.225
20	1.673	.088	-.209
25	1.790	.237	-.197
30	1.793	.378	-.180
35	1.745	.469	-.143
40	1.737	.569	-.107
45	1.602	.653	-.091
$C_{T,s} = 0.30$			
-20	-0.291	0.008	-0.171
-15	-.207	-.068	-.154
-10	-.079	-.119	-.136
-5	.125	-.140	-.132
0	.589	-.097	-.184
5	1.156	.024	-.252
10	1.640	.179	-.283
15	1.917	.338	-.284
20	2.161	.528	-.283
25	2.215	.730	-.287
30	2.257	.876	-.246
35	2.188	.963	-.184
40	2.114	1.040	-.134
$C_{T,s} = 0$			
-20	-0.269	0.361	-0.143
-15	-.233	.276	-.133
-10	-.101	.228	-.118
-5	.089	.185	-.132
0	.649	.217	-.193
5	1.419	.355	-.313
10	2.005	.544	-.359
15	2.395	.747	-.345
20	2.660	.961	-.328
25	2.608	1.143	-.312
30	2.603	1.311	-.267

TABLE 12.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 50^\circ$, $\delta_s = 20^\circ$ (FULL SPAN)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s}$ = 1.00		
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.271	-0.870	-0.119
5	.359	-.839	-.116
10	.429	-.809	-.113
15	.501	-.766	-.115
20	.565	-.712	-.116
25	------	------	------
30	.678	-.600	-.124
35	------	------	------
40	.792	-.488	-.126
45	------	------	------
50	.850	-.358	-.130
55	------	------	------
60	.888	-.204	-.144
65	------	------	------
70	.897	-.017	-.159
75	------	------	------
80	.893	.127	-.162
90	.857	.282	-.149
	$C_{T,s}$ = 0.95		
-20	-0.162	-0.828	-0.124
-15	-.033	-.843	-.122
-10	.114	-.851	-.119
-5	.242	-.834	-.124
0	.388	-.800	-.125
5	.494	-.760	-.123
10	.625	-.696	-.133
15	.722	-.626	-.126
20	.827	-.526	-.143
25	.917	-.425	-.150
30	.962	-.336	-.156
35	.997	-.250	-.151
40	1.028	-.160	-.137
45	1.058	-.042	-.137
50	1.054	.031	-.125
55	1.046	.109	-.118
60	1.047	.176	-.100
65	1.099	.244	-.032
70	1.086	.306	-.016
	$C_{T,s}$ = 0.90		
-20	-0.242	-0.748	-0.134
-15	-.094	-.776	-.133
-10	.110	-.783	-.132
-5	.295	-.765	-.141
0	.459	-.727	-.141
5	.614	-.671	-.142
10	.755	-.588	-.147
15	.872	-.505	-.149
20	1.033	-.376	-.166
25	1.111	-.264	-.166
30	1.143	-.157	-.162
35	1.197	-.026	-.162
40	1.186	.064	-.153
45	1.175	.158	-.142
50	1.143	.221	-.126
55	1.116	.283	-.110
60	1.102	.348	-.094

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s}$ = 0.80		
-20	-0.290	-0.613	-0.142
-15	-.158	-.652	-.124
-10	.059	-.667	-.136
-5	.295	-.651	-.152
0	.549	-.599	-.164
5	.786	-.519	-.171
10	.995	-.418	-.183
15	1.167	-.299	-.187
20	1.323	-.162	-.192
25	1.420	-.034	-.183
30	1.468	.088	-.168
35	1.423	.202	-.170
40	1.402	.333	-.161
45	1.332	.397	-.133
50	1.294	.473	-.101
	$C_{T,s}$ = 0.60		
-20	-0.322	-0.331	-0.162
-15	-.192	-.386	-.146
-10	-.014	-.421	-.142
-5	.282	-.413	-.161
0	.682	-.350	-.195
5	1.079	-.245	-.227
10	1.407	-.105	-.248
15	1.589	.033	-.238
20	1.734	.179	-.217
25	1.841	.333	-.203
30	1.780	.443	-.157
35	1.698	.514	-.145
40	1.692	.601	-.096
	$C_{T,s}$ = 0.30		
-20	-0.298	0.005	-0.150
-15	-.206	-.054	-.153
-10	-.049	-.116	-.142
-5	.213	-.124	-.137
0	.818	-.025	-.214
5	1.354	.100	-.287
10	1.724	.261	-.286
15	2.007	.421	-.281
20	2.194	.607	-.272
25	2.235	.802	-.264
30	2.256	.933	-.210
35	2.146	.998	-.160
	$C_{T,s}$ = 0		
-20	-0.314	0.372	-0.138
-15	-.234	.293	-.133
-10	-.092	.231	-.122
-5	.224	.209	-.149
0	.897	.290	-.254
5	1.601	.447	-.344
10	2.139	.647	-.361
15	2.405	.828	-.329
20	2.584	1.003	-.296
25	2.512	1.228	-.300
30	2.510	1.353	-.245
35	2.473	1.447	-.187

TABLE 13.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 50^\circ$, $\delta_k = 50^\circ$ (OUTBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 1.00$			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.398	-0.836	-0.164
5	.476	-.796	-.158
10	.554	-.761	-.157
15	.605	-.711	-.161
20	.674	-.659	-.162
25	------	------	------
30	.779	-.535	-.163
35	------	------	------
40	.847	-.413	-.174
45	------	------	------
50	.885	-.275	-.176
55	------	------	------
60	.927	-.095	-.188
65	------	------	------
70	.927	.063	-.192
75	------	------	------
80	.908	.219	-.187
90	.843	.379	-.197
$C_{T,s} = 0.95$			
-20	0.070	-0.853	-0.170
-15	.187	-.852	-.187
-10	.319	-.837	-.185
-5	.428	-.807	-.177
0	.556	-.765	-.182
5	.676	-.700	-.179
10	.781	-.623	-.178
15	.873	-.546	-.178
20	.946	-.445	-.185
25	1.016	-.348	-.184
30	1.066	-.246	-.180
35	1.109	-.137	-.181
40	1.136	-.028	-.174
45	1.130	.050	-.158
50	1.129	.127	-.144
55	1.110	.202	-.125
60	1.095	.271	-.112
65	1.071	.324	-.090
$C_{T,s} = 0.90$			
-20	0.037	-0.782	-0.223
-15	.208	-.788	-.206
-10	.353	-.770	-.203
-5	.496	-.740	-.187
0	.650	-.687	-.194
5	.793	-.616	-.195
10	.925	-.518	-.193
15	1.013	-.436	-.200
20	1.106	-.311	-.198
25	1.168	-.197	-.199
30	1.217	-.078	-.192
35	1.239	.028	-.184
40	1.241	.128	-.173
45	1.210	.195	-.152
50	1.159	.261	-.143
55	1.123	.319	-.132
60	1.097	.403	-.124

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s} = 0.80$			
-20	-0.107	-0.656	-0.198
-15	.163	-.665	-.223
-10	.386	-.651	-.232
-5	.582	-.618	-.227
0	.789	-.552	-.225
5	.990	-.461	-.236
10	1.176	-.347	-.247
15	1.306	-.242	-.240
20	1.308	-.115	-.229
25	1.363	.030	-.237
30	1.368	.140	-.219
35	1.343	.224	-.194
40	1.327	.313	-.172
45	1.293	.390	-.146
50	1.260	.464	-.125
$C_{T,s} = 0.60$			
-20	-0.245	-0.399	-0.197
-15	.079	-.434	-.230
-10	.418	-.421	-.253
-5	.706	-.372	-.264
0	.992	-.303	-.257
5	1.270	-.200	-.275
10	1.521	-.060	-.272
15	1.706	.076	-.270
20	1.697	.237	-.262
25	1.617	.439	-.264
30	1.525	.460	-.214
$C_{T,s} = 0.30$			
-20	-0.405	-0.038	-0.169
-15	-.036	-.097	-.222
-10	.422	-.099	-.267
-5	.791	-.052	-.297
0	1.188	.046	-.318
5	1.555	.153	-.319
10	1.857	.309	-.310
15	2.096	.458	-.302
20	2.299	.646	-.296
25	1.893	.782	-.302
30	1.647	.854	-.253
$C_{T,s} = 0$			
-20	-0.431	0.295	-0.179
-15	.042	.236	-.284
-10	.521	.225	-.329
-5	.950	.279	-.351
0	1.421	.372	-.370
5	1.821	.495	-.373
10	2.167	.656	-.364
15	2.469	.799	-.346
20	2.690	.984	-.319
25	2.108	1.177	-.358
30	1.670	1.185	-.305

TABLE 14.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 50^\circ$, $\delta_k = 50^\circ$ (FULL SPAN)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 1.00$		
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.247	-0.842	-0.100
5	.316	-.817	-.101
10	.392	-.784	-.103
15	.456	-.749	-.101
20	.538	-.693	-.106
25	------	------	------
30	.640	-.599	-.102
35	------	------	------
40	.741	-.480	-.107
45	------	------	------
50	.799	-.360	-.113
55	------	------	------
60	.845	-.216	-.125
65	------	------	------
70	.870	-.068	-.127
75	------	------	------
80	.866	.074	-.133
90	.844	.226	-.131
	$C_{T,s} = 0.95$		
-20	-0.176	-0.789	-0.121
-15	-.054	-.813	-.110
-10	.095	-.821	-.108
-5	.227	-.812	-.108
0	.362	-.784	-.111
5	.475	-.745	-.106
10	.596	-.691	-.107
15	.695	-.633	-.110
20	.788	-.549	-.114
25	.870	-.462	-.114
30	.930	-.358	-.128
35	.956	-.274	-.120
40	.990	-.183	-.119
45	1.014	-.095	-.109
50	1.033	-.007	-.101
55	1.038	.071	-.090
60	1.063	.148	-.059
65	1.101	.231	-.015
70	1.089	.293	0
75	1.072	.352	.017
	$C_{T,s} = 0.90$		
-20	-0.253	-0.709	-0.109
-15	-.093	-.742	-.114
-10	.083	-.748	-.117
-5	.250	-.743	-.130
0	.435	-.713	-.124
5	.578	-.665	-.129
10	.728	-.592	-.130
15	.842	-.520	-.126
20	------	------	------
25	1.053	-.298	-.128
30	1.118	-.173	-.151
35	1.158	-.059	-.151
40	1.152	.036	-.142
45	1.144	.129	-.140
50	1.118	.191	-.121
55	1.118	.277	-.099
60	1.105	.327	-.076
65	1.079	.376	-.054

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
	$C_{T,s} = 0.80$		
-20	-0.304	-0.564	-0.105
-15	-.189	-.614	-.099
-10	.006	-.629	-.103
-5	.236	-.620	-.128
0	.517	-.573	-.144
5	.736	-.523	-.145
10	.945	-.433	-.151
15	1.094	-.332	-.152
20	1.262	-.192	-.161
25	1.301	-.058	-.172
30	1.354	.077	-.175
35	1.395	.194	-.161
40	1.373	.319	-.154
45	1.326	.391	-.129
50	1.292	.467	-.107
	$C_{T,s} = 0.60$		
-20	-0.273	-0.312	-0.127
-15	-.190	-.365	-.109
-10	-.064	-.412	-.086
-5	.156	-.418	-.120
0	.517	-.364	-.157
5	.972	-.263	-.195
10	1.312	-.140	-.212
15	1.531	-.012	-.210
20	1.728	.153	-.204
25	1.673	.371	-.207
30	1.655	.453	-.205
35	1.650	.578	-.181
	$C_{T,s} = 0.30$		
-20	-0.269	0.032	-0.118
-15	-.168	-.031	-.098
-10	-.061	-.082	-.089
-5	.062	-.122	-.078
0	.630	-.049	-.172
5	1.207	.090	-.237
10	1.649	.240	-.259
15	1.964	.396	-.263
20	2.187	.590	-.244
25	2.311	.767	-.228
30	1.845	.863	-.226
35	1.735	.929	-.191
	$C_{T,s} = 0$		
-20	-0.284	0.379	-0.106
-15	-.198	.316	-.088
-10	-.098	.233	-.071
-5	.058	.202	-.076
0	.668	.247	-.172
5	1.391	.410	-.342
10	1.971	.591	-.307
15	2.343	.775	-.295
20	2.618	.982	-.278
25	2.090	1.112	-.294
30	1.769	1.155	-.242

TABLE 15.- TABULATED AERODYNAMIC DATA FOR $\delta_f = 50^\circ$, $\delta_k = 50^\circ$ (INBOARD)

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 1.00			
-20	------	------	------
-15	------	------	------
-10	------	------	------
-5	------	------	------
0	0.279	-0.867	-0.078
5	.356	-.844	-.083
10	.433	-.814	-.086
15	.486	-.767	-.088
20	.555	-.716	-.086
25	------	------	------
30	.662	-.619	-.090
35	------	------	------
40	.762	-.512	-.081
45	------	------	------
50	.826	-.372	-.099
55	------	------	------
60	.885	-.211	-.104
65	------	------	------
70	.903	-.058	-.122
75	------	------	------
80	.891	.098	-.126
90	.866	.257	-.121
$C_{T,s}$ = 0.95			
-20	-0.103	-0.824	-0.122
-15	.020	-.839	-.112
-10	.144	-.841	-.104
-5	.255	-.830	-.100
0	.380	-.803	-.098
5	.495	-.763	-.095
10	.614	-.708	-.093
15	.718	-.628	-.100
20	.809	-.559	-.103
25	.882	-.470	-.104
30	.937	-.367	-.122
35	.964	-.292	-.114
40	1.005	-.188	-.114
45	1.024	-.100	-.102
50	1.038	-.004	-.099
55	1.041	.063	-.083
60	1.115	.161	-.030
65	1.101	.236	-.016
70	1.090	.300	.002
75	1.075	.342	.023
$C_{T,s}$ = 0.90			
-20	-0.161	-0.736	-0.127
-15	-.022	-.757	-.119
-10	.142	-.762	-.117
-5	.297	-.761	-.123
0	.469	-.727	-.116
5	.608	-.680	-.121
10	.746	-.608	-.121
15	.860	-.527	-.126
20	.983	-.422	-.128
25	1.077	-.290	-.144
30	1.129	-.176	-.148
35	1.168	-.061	-.145
40	1.168	.037	-.145
45	1.142	.121	-.134
50	1.135	.200	-.112
55	1.113	.264	-.096
60	1.101	.310	-.078
65	1.076	.369	-.050

α, deg	$C_{L,s}$	$C_{D,s}$	$C_{m,s}$
$C_{T,s}$ = 0.80			
-20	-0.213	-0.608	-0.134
-15	-.095	-.636	-.127
-10	.109	-.649	-.127
-5	.357	-.629	-.146
0	.568	-.595	-.141
5	.786	-.515	-.149
10	.969	-.443	-.154
15	1.119	-.335	-.159
20	1.280	-.201	-.159
25	1.316	-.066	-.164
30	1.369	.073	-.178
35	1.412	.189	-.164
40	1.377	.319	-.163
45	1.347	.403	-.144
50	1.304	.464	-.113
$C_{T,s}$ = 0.60			
-20	-0.191	-0.335	-0.154
-15	-.083	-.383	-.140
-10	.115	-.400	-.149
-5	.334	-.384	-.157
0	.663	-.342	-.168
5	1.025	-.258	-.190
10	1.346	-.138	-.211
15	1.564	.002	-.215
20	1.740	.162	-.209
25	1.602	.310	-.215
30	1.638	.455	-.209
35	1.624	.566	-.179
$C_{T,s}$ = 0.30			
-20	-0.148	0.009	-0.188
-15	-.014	-.050	-.177
-10	.137	-.077	-.174
-5	.415	-.057	-.195
0	.808	-.018	-.215
5	1.261	.088	-.246
10	1.704	.244	-.258
15	1.984	.391	-.259
20	2.203	.581	-.240
25	1.854	.754	-.277
30	1.771	.835	-.220
35	1.623	.875	-.188
$C_{T,s}$ = 0			
-20	-0.088	0.333	-0.215
-15	.029	.288	-.210
-10	.199	.242	-.206
-5	.523	.260	-.232
0	1.000	.314	-.257
5	1.520	.421	-.293
10	2.033	.601	-.319
15	2.347	.773	-.303
20	2.614	.966	-.280
25	1.936	1.082	-.314
30	1.505	1.054	-.247

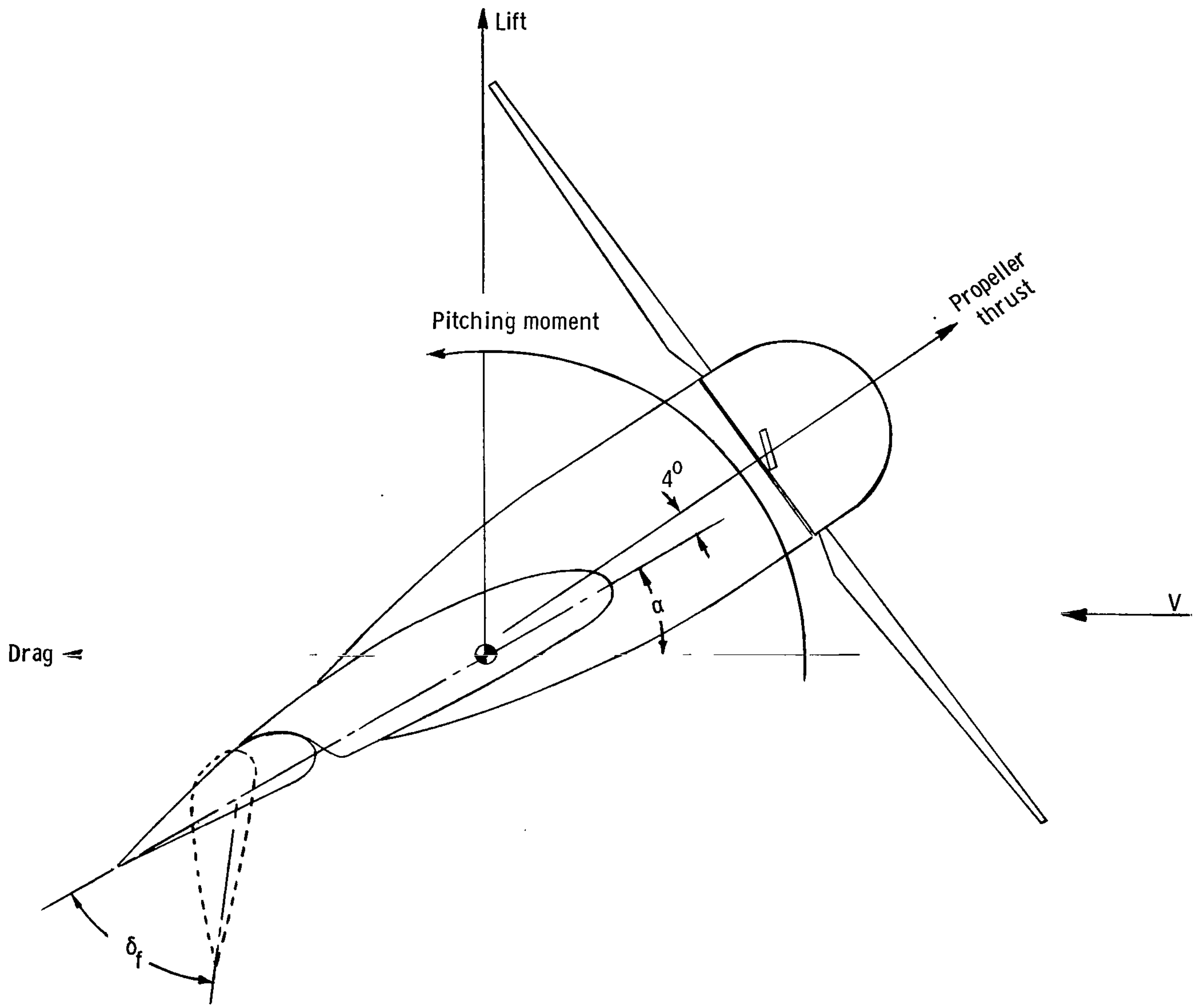
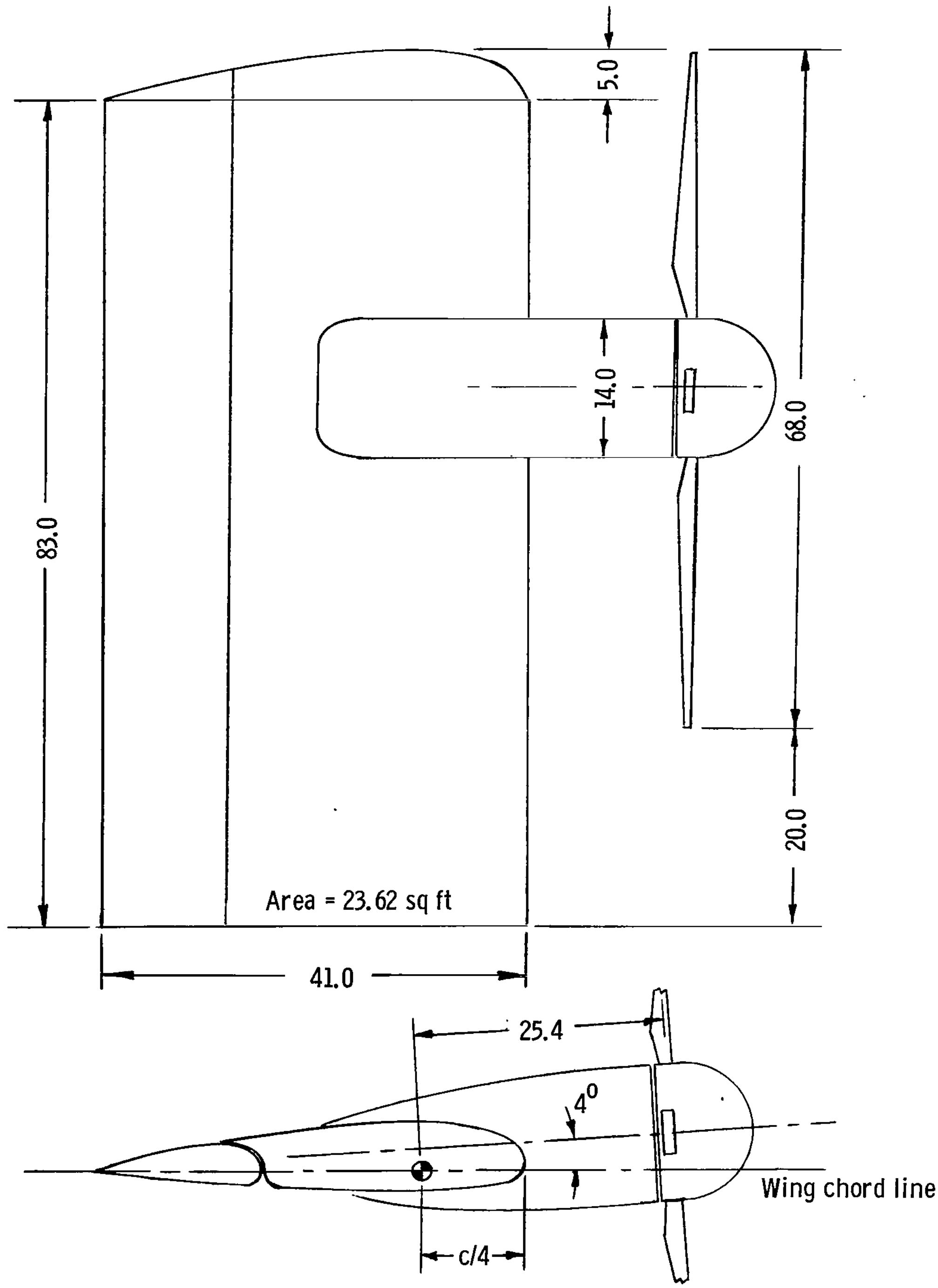
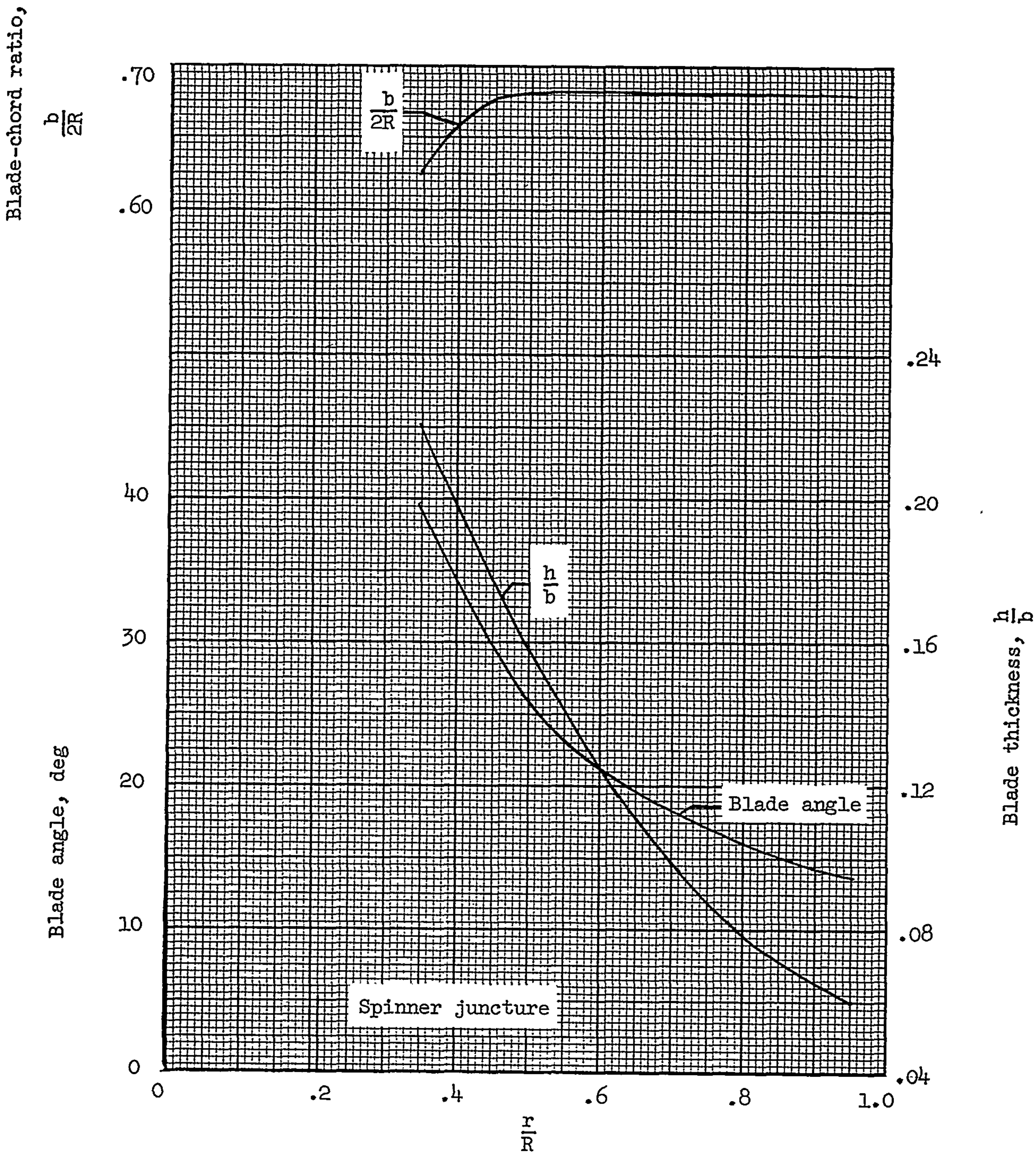


Figure 1.- The positive sense of forces, moments, and angles.



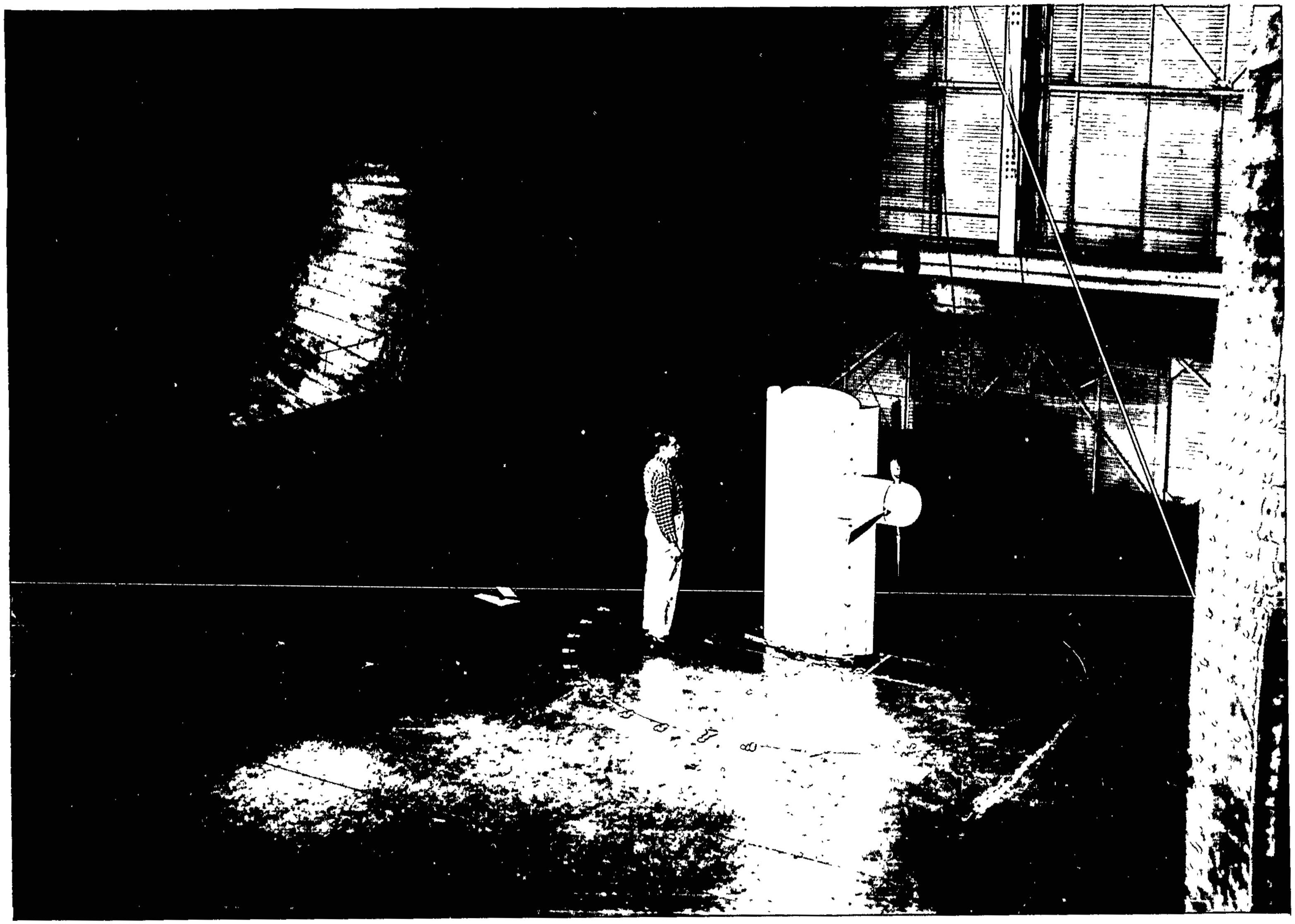
(a) Principal dimensions in inches.

Figure 2.- Principal dimensions of model, propeller blade form curves, and photograph showing model mounted in tunnel.



(b) Propeller blade form curves.

Figure 2.- Continued.



(c) Photograph of model in the tunnel. L-64-1759

Figure 2.- Concluded.

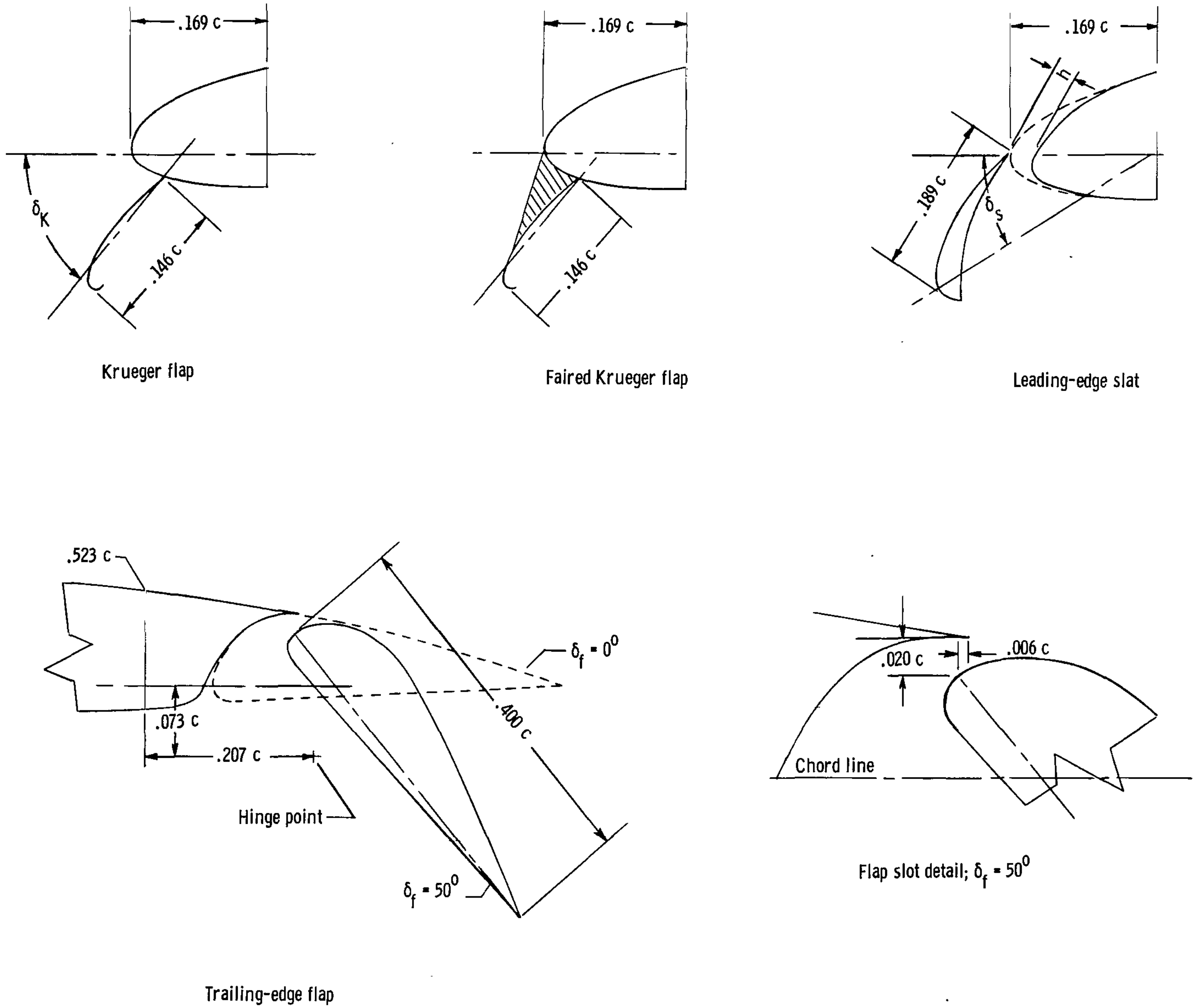
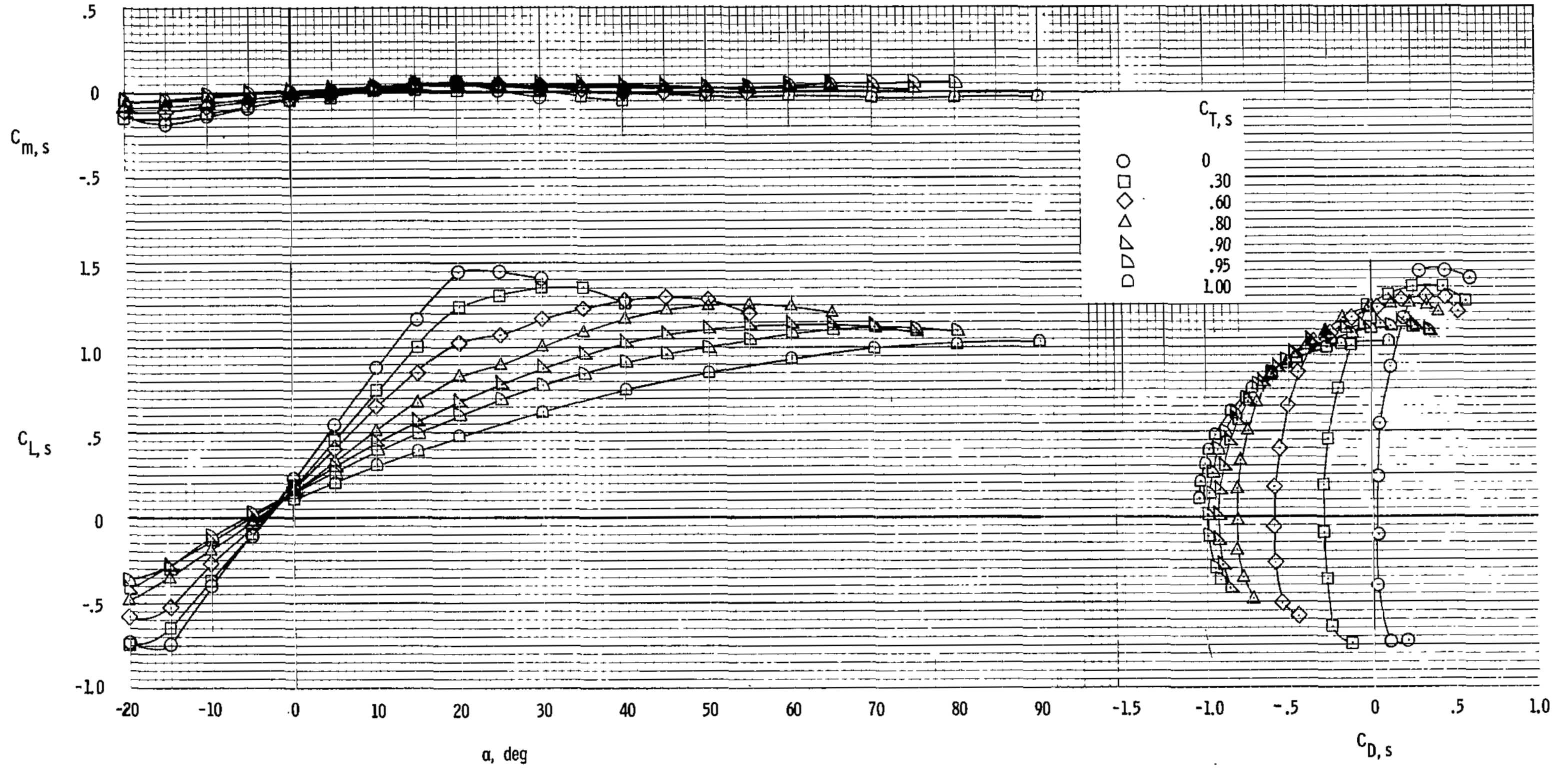
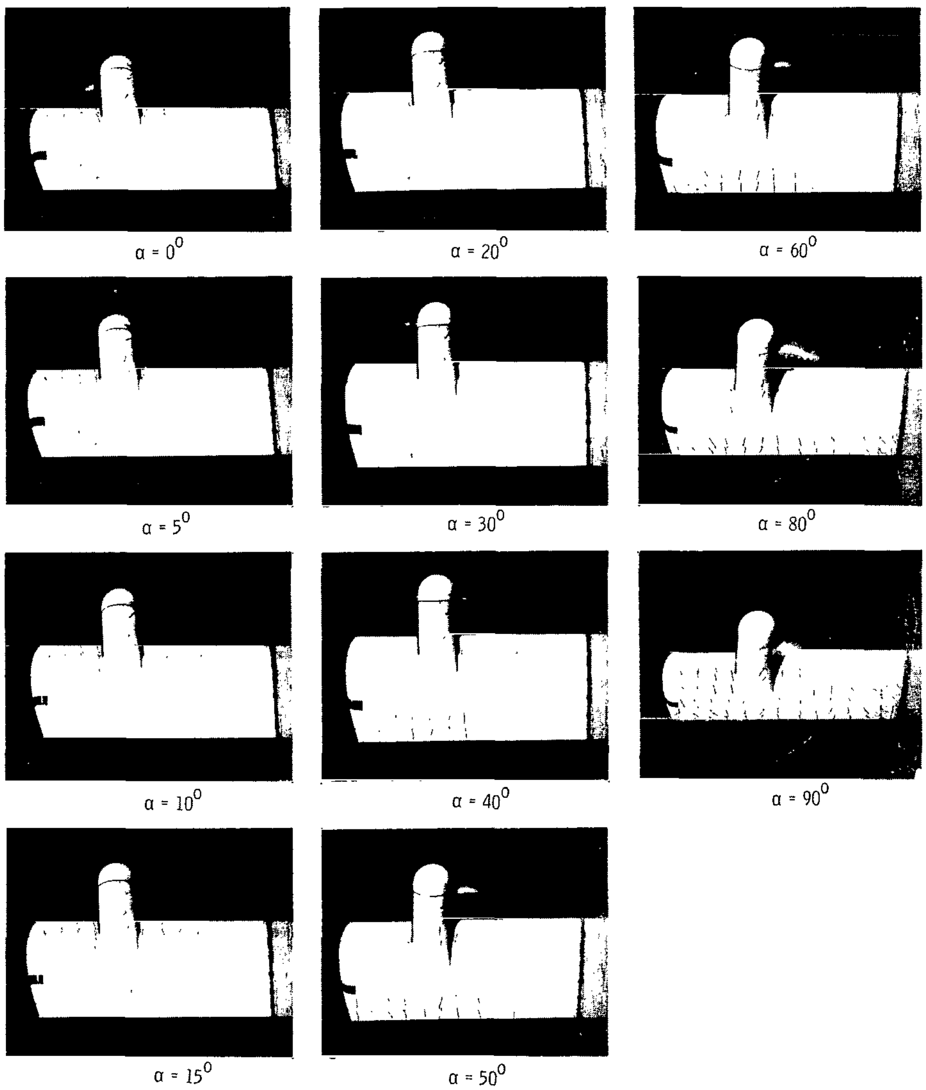


Figure 3.- Sectional views of various leading-edge devices and trailing-edge flap.



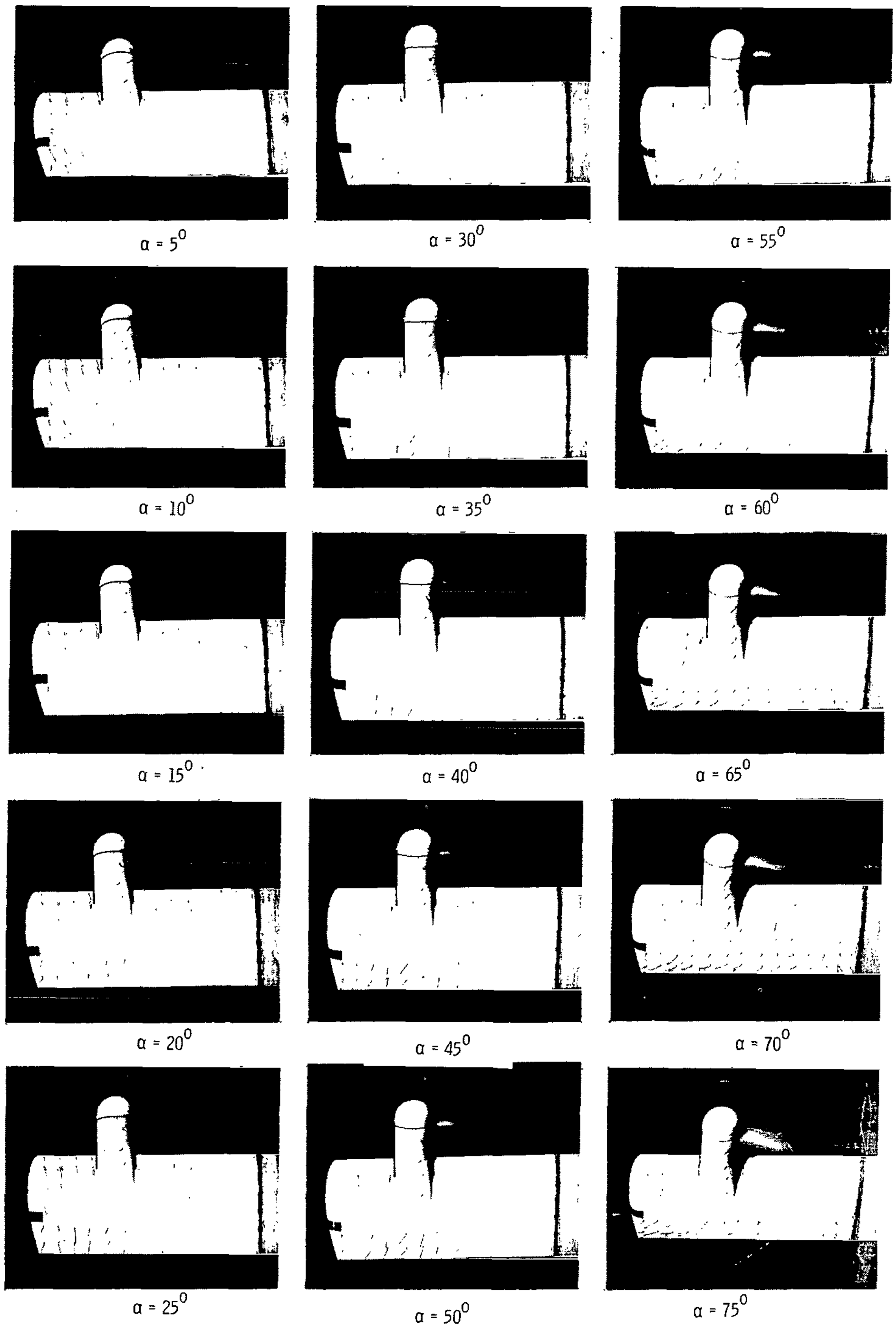
(a) Aerodynamic characteristics.

Figure 4.- Aerodynamic and flow characteristics of the model with the basic leading edge and with the trailing-edge flap undeflected. $\delta_f = 0^{\circ}$.



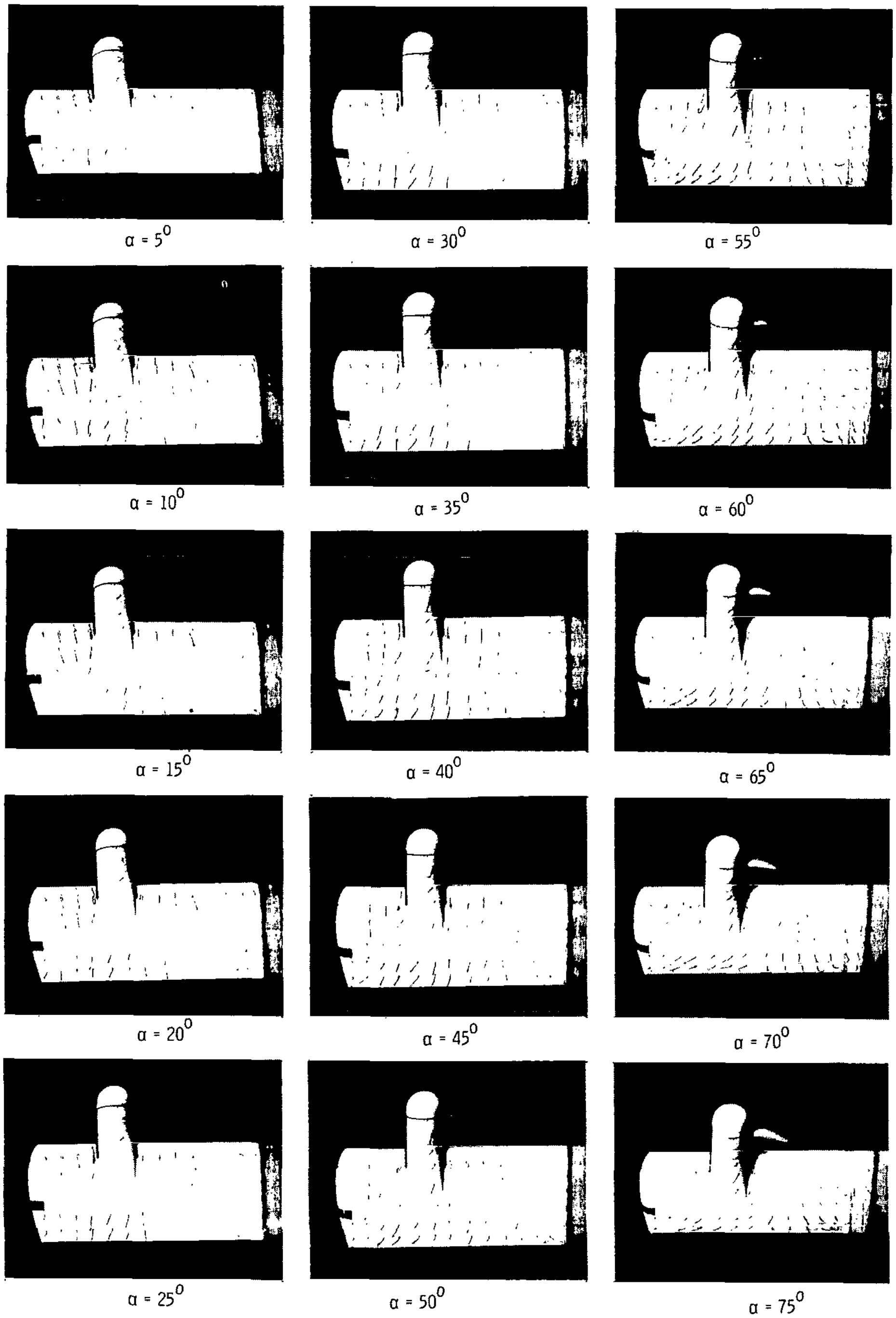
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7101

Figure 4.- Continued.



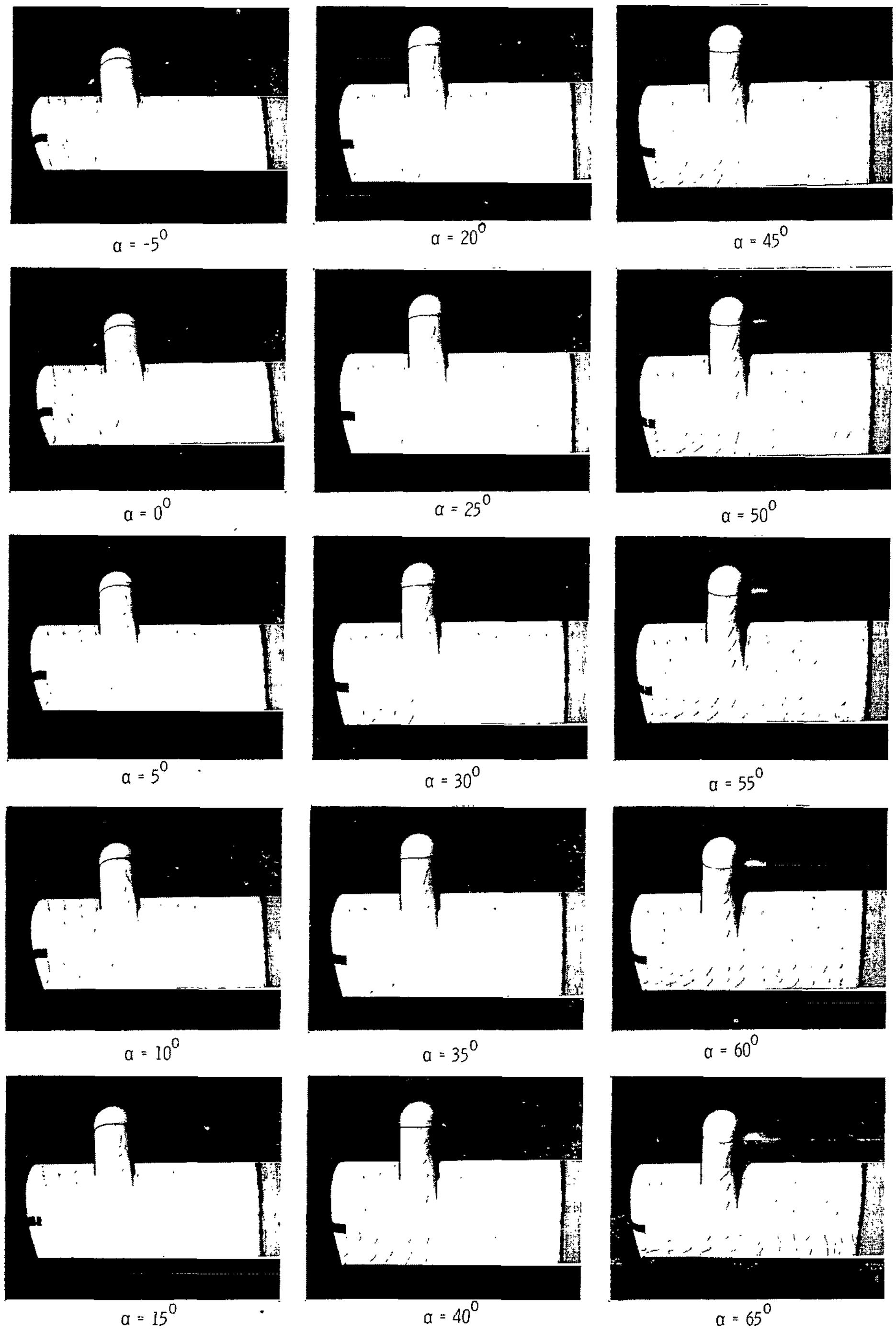
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7102

Figure 4.- Continued.



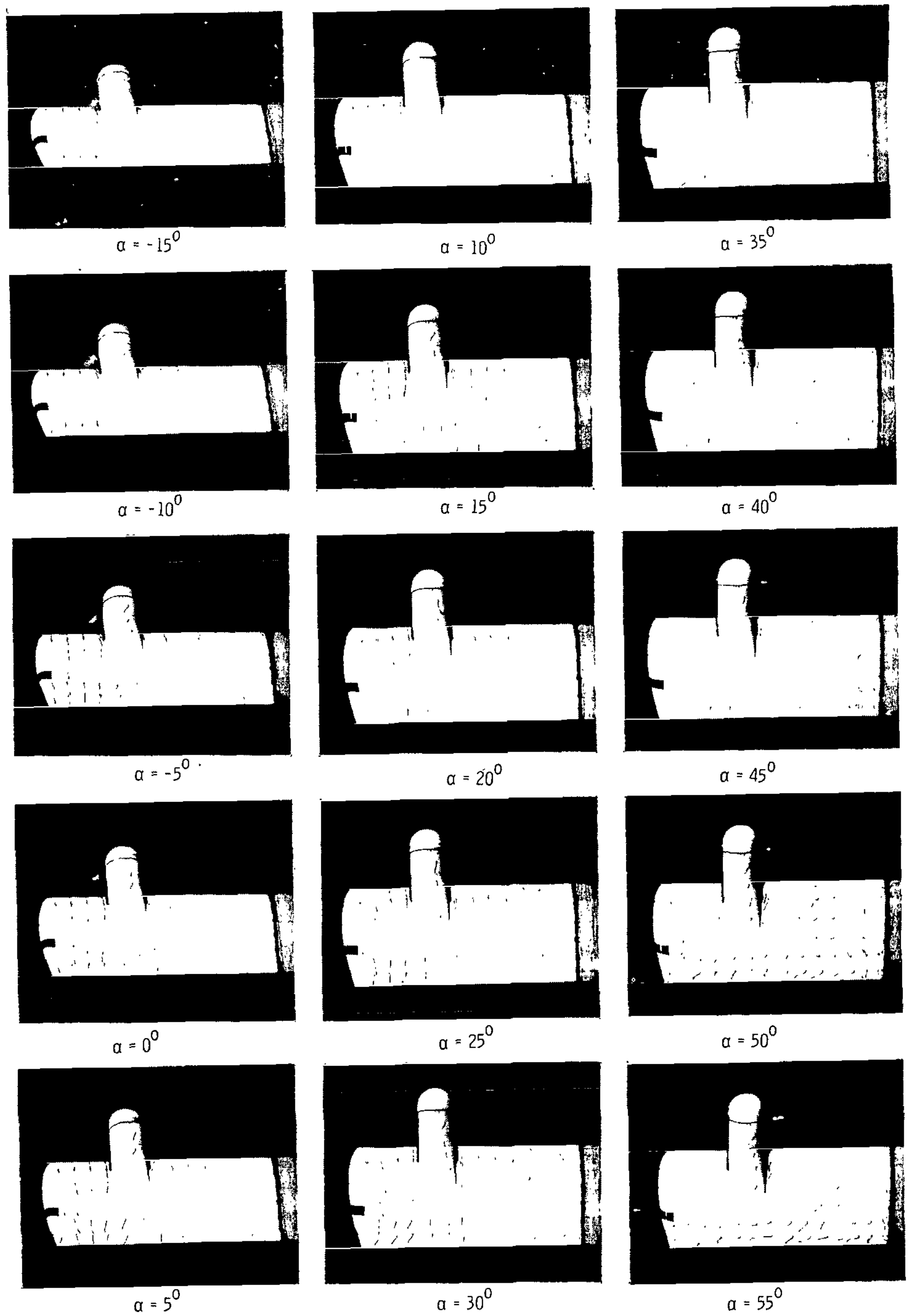
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7103

Figure 4.- Continued.



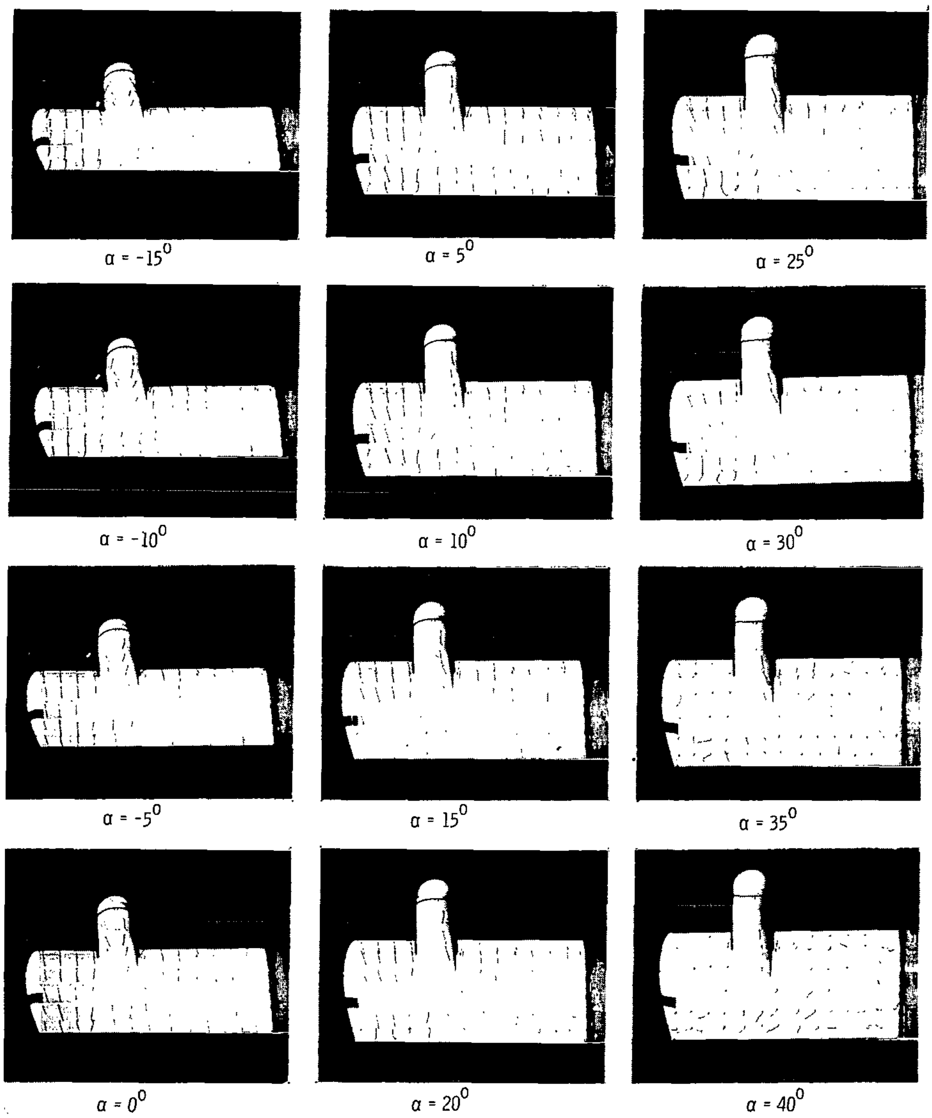
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7104

Figure 4.- Continued.



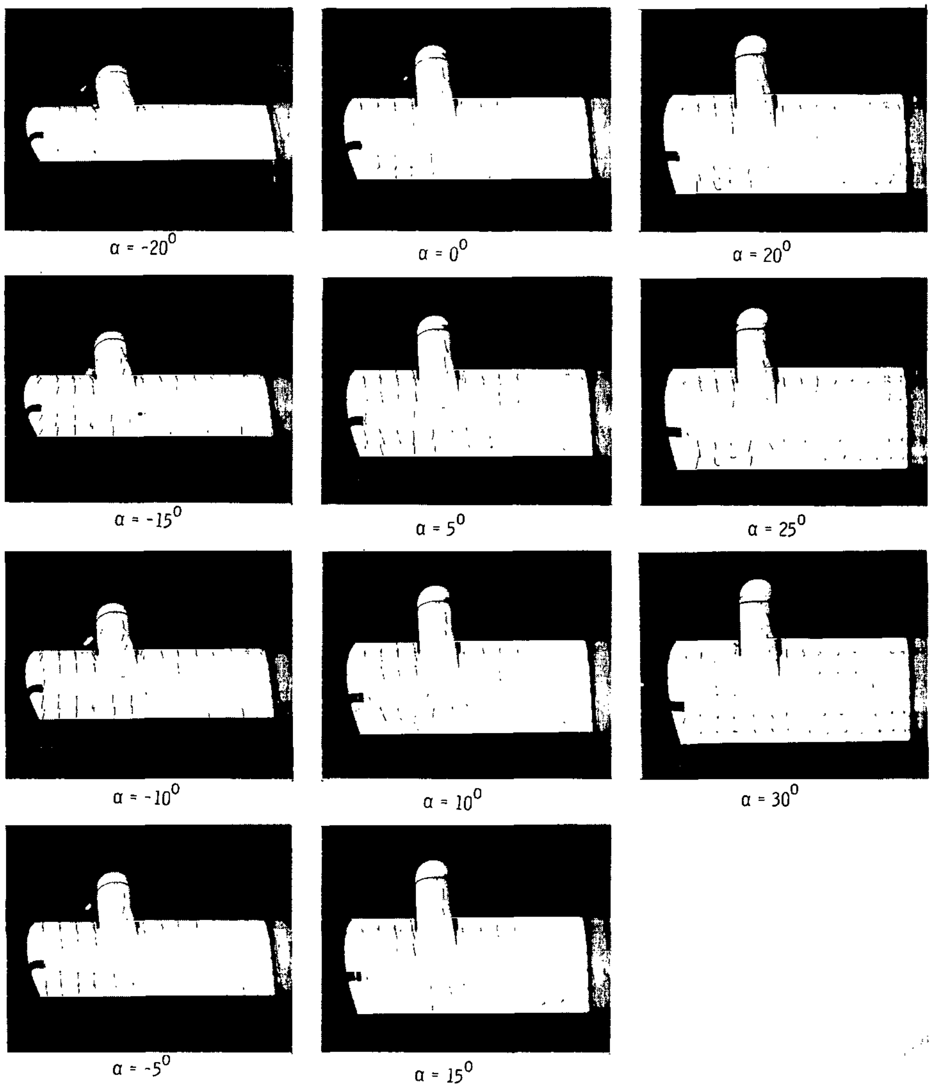
(f) Flow characteristics; $C_{T,s}$ = 0.60. L-64-7105

Figure 4.- Continued.



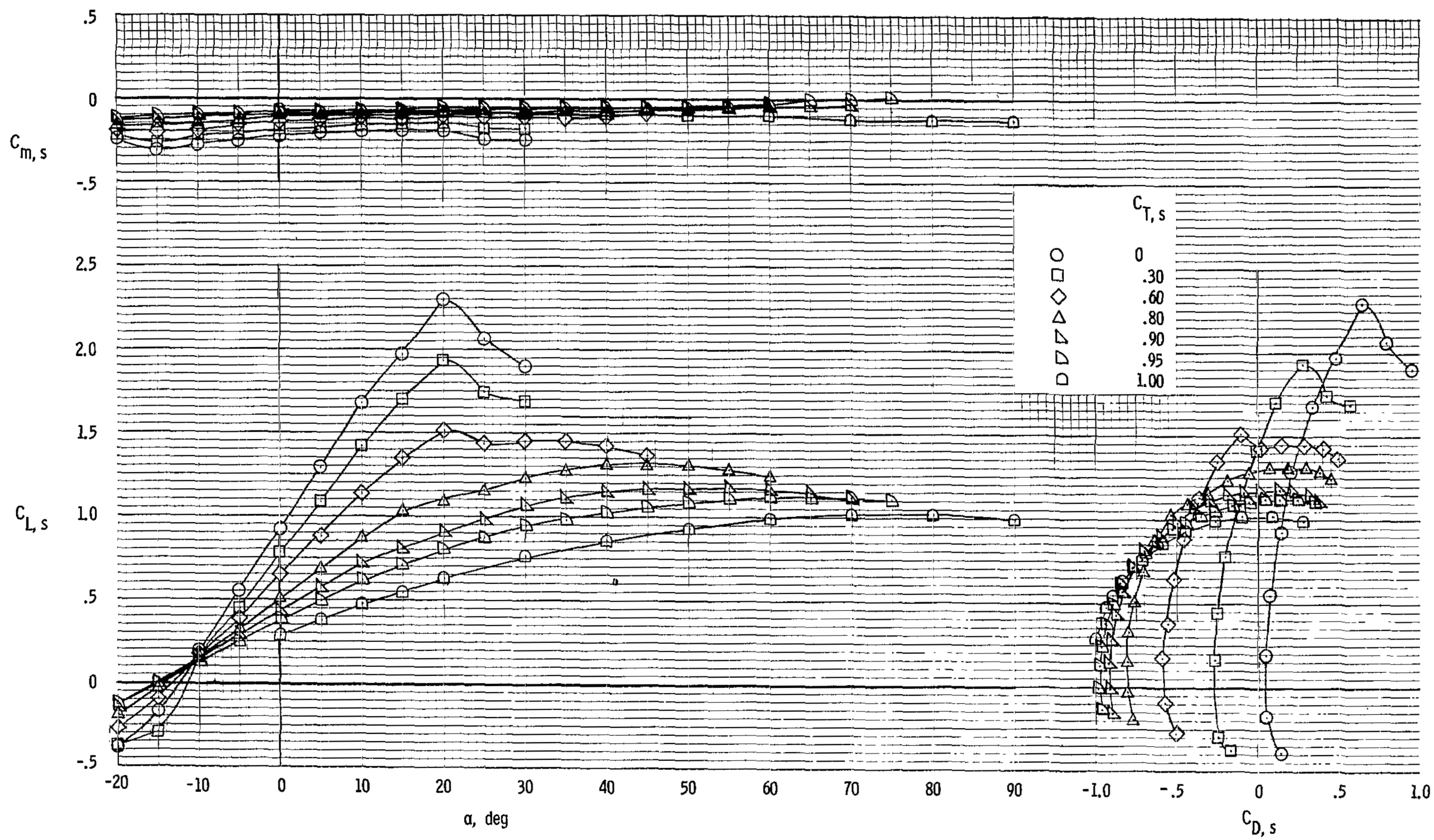
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7106

Figure 4.- Continued.



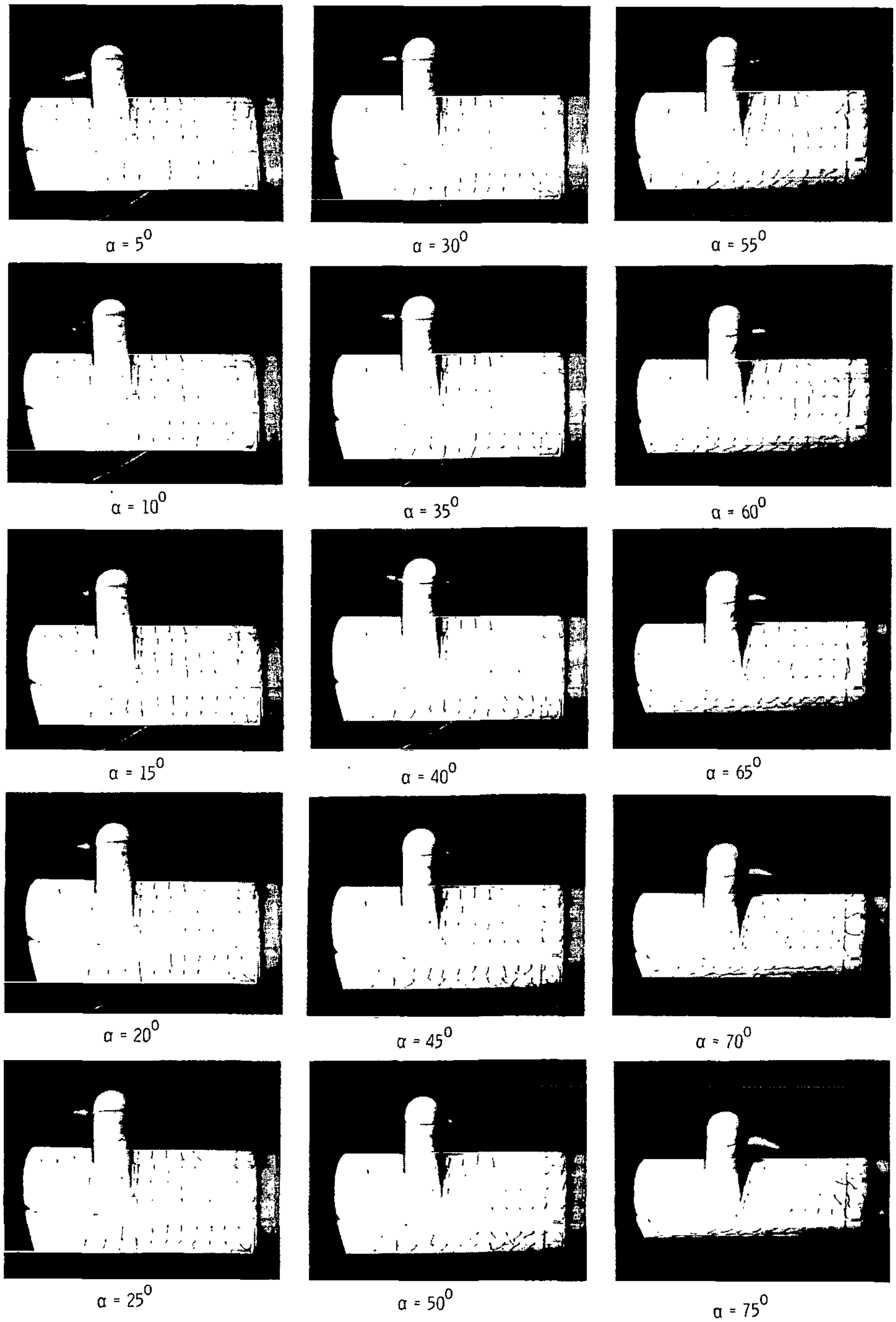
(h) Flow characteristics; $C_{T,s} = 0$.   L-64-7107

Figure 4.- Concluded.



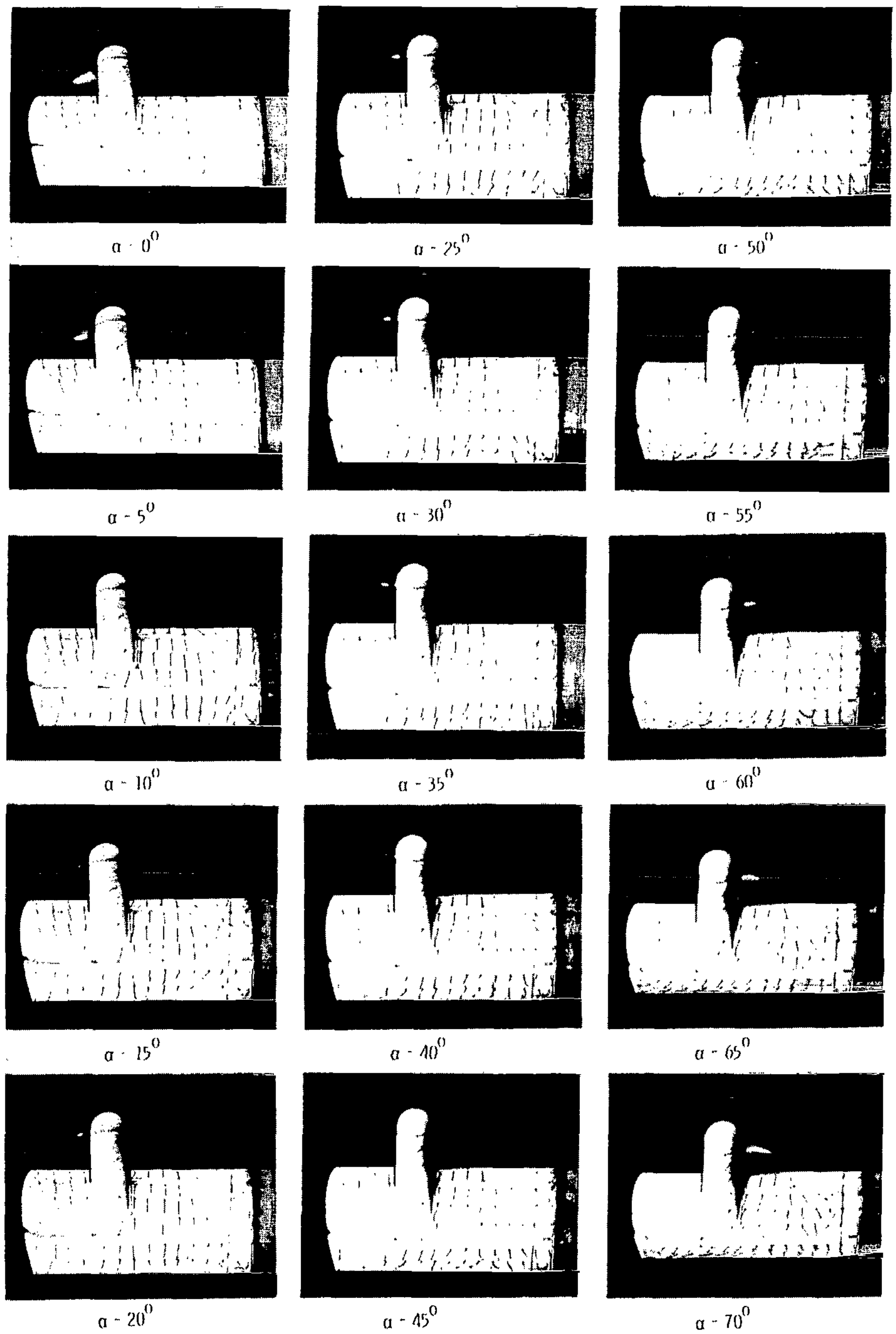
(a) Aerodynamic characteristics.

Figure 5.- *Aerodynamic and flow characteristics of the model with the basic leading edge and with the trailing-edge flap deflected* 20°.



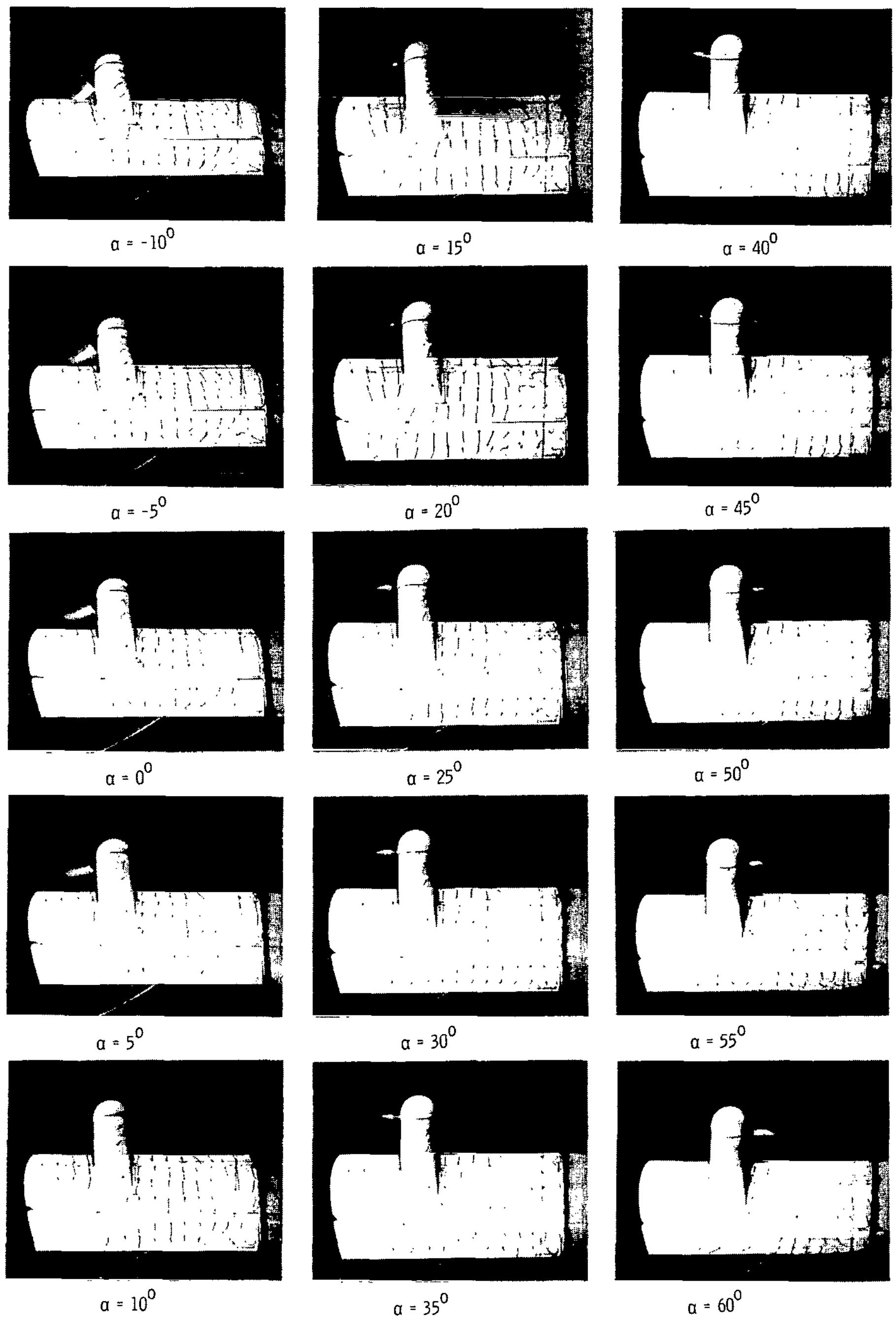
(b) Flow characteristics; $C_{T,s} = 0.95$. L-64-7108

Figure 5.- Continued.



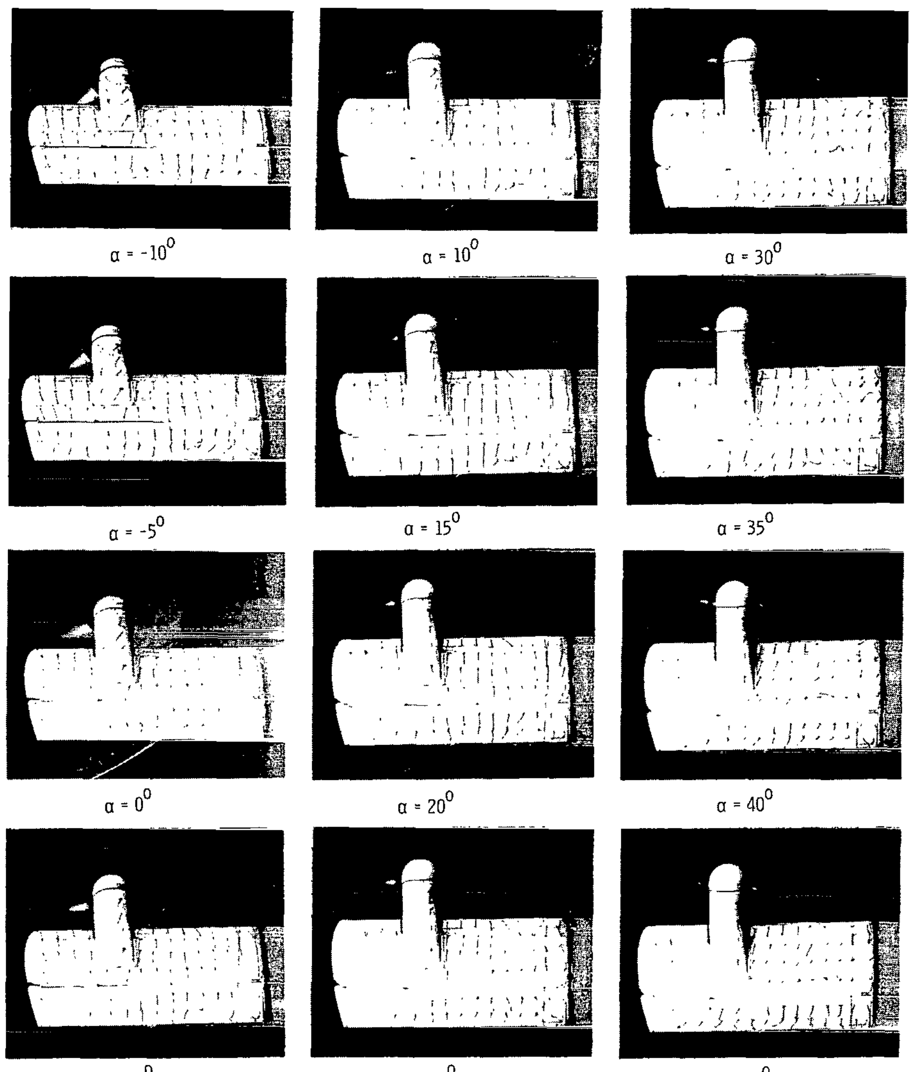
(c) Flow characteristics; $C_{T,s} = 0.90$. L-64-7109

Figure 5.- Continued.



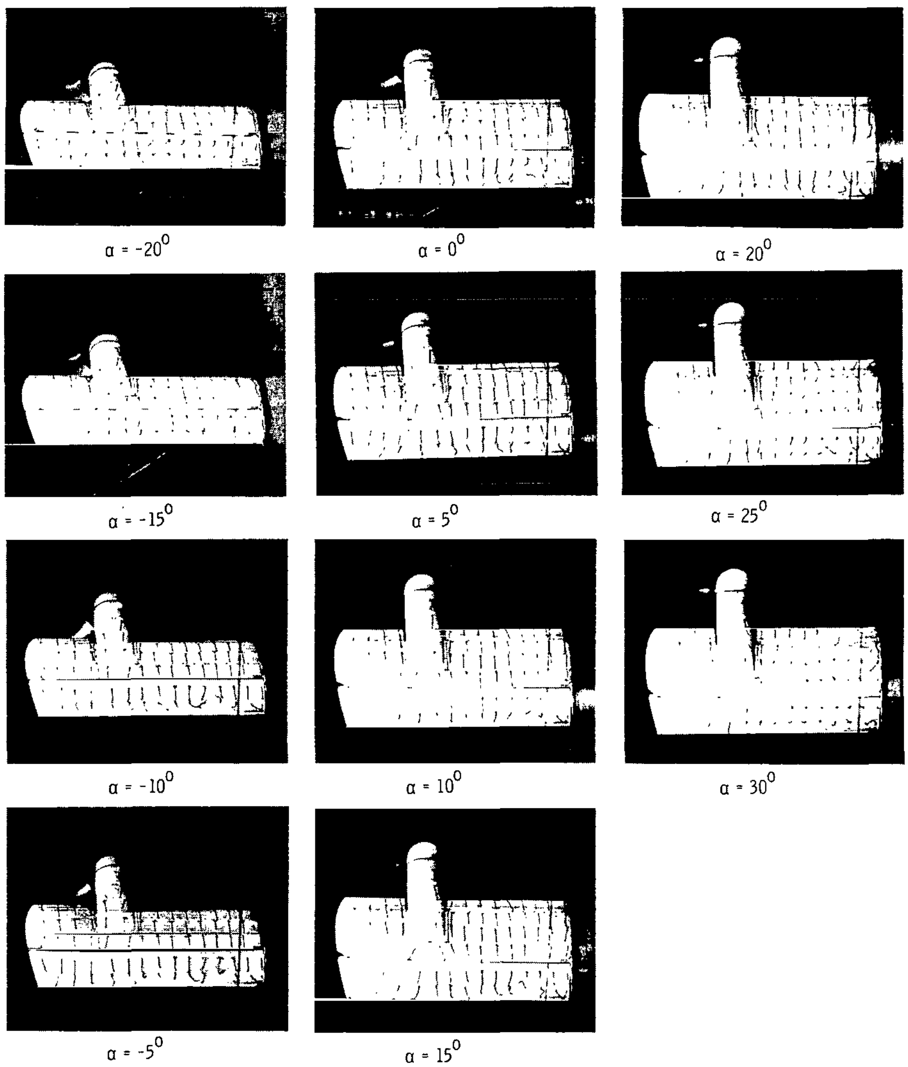
(d) Flow characteristics; $C_{T,s} = 0.80$. L-64-7110

Figure 5.- Continued.



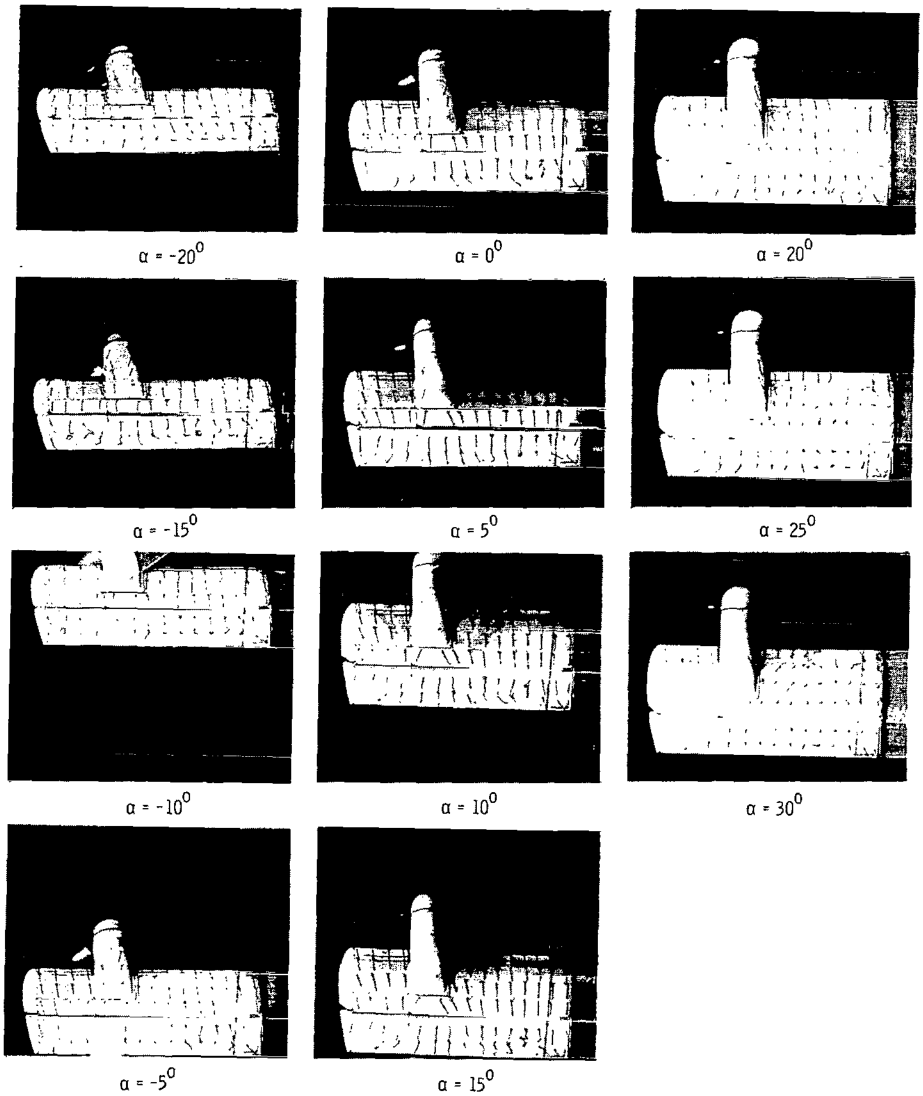
(e) Flow characteristics; $C_{T,s} = 0.60$. L-64-7111

Figure 5.- Continued.



(f) Flow characteristics; $C_{T,s} = 0.30$. L-64-7112

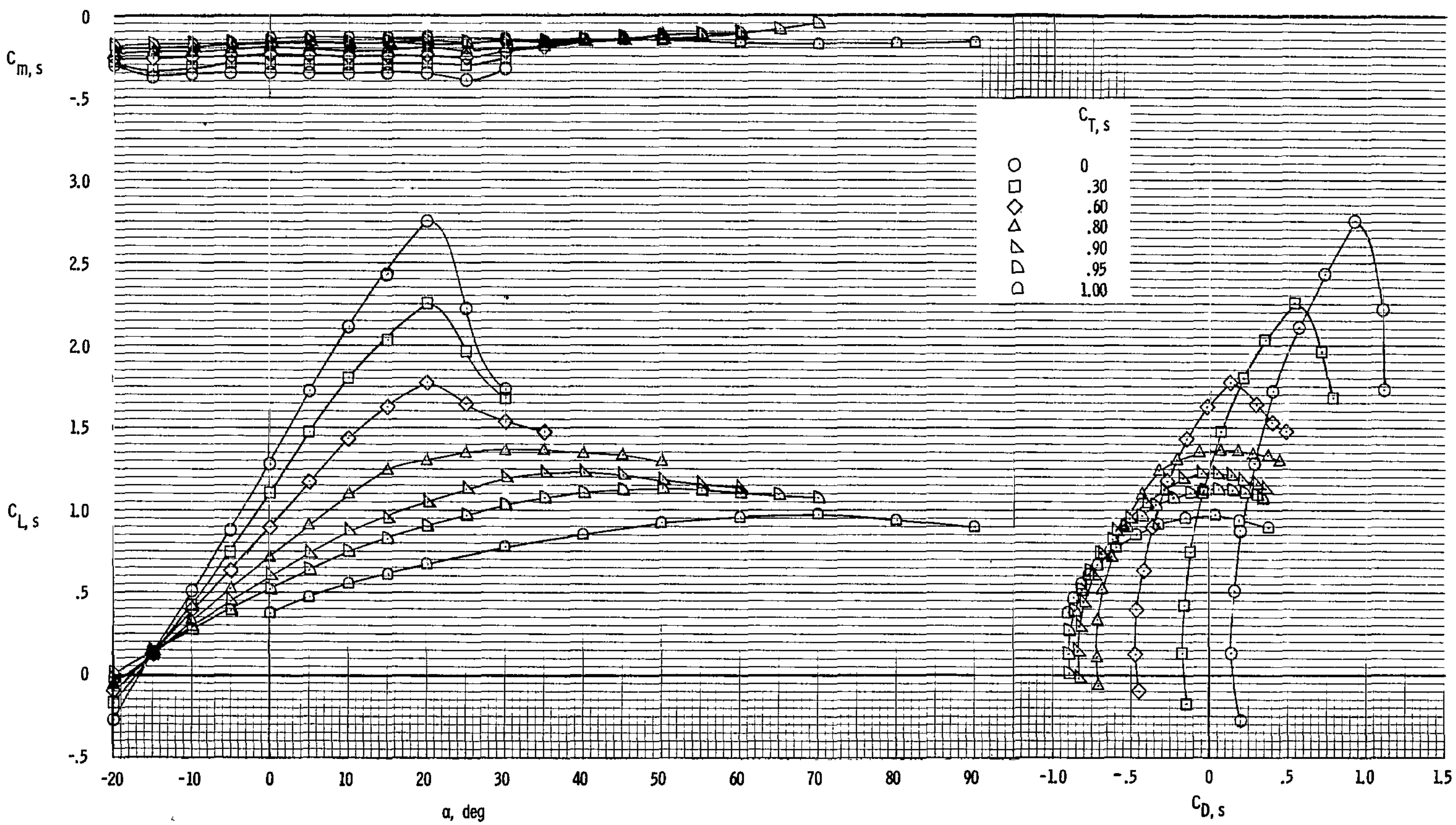
Figure 5.- Continued.



(g) Flow characteristics; $C_{T,s} = 0$.

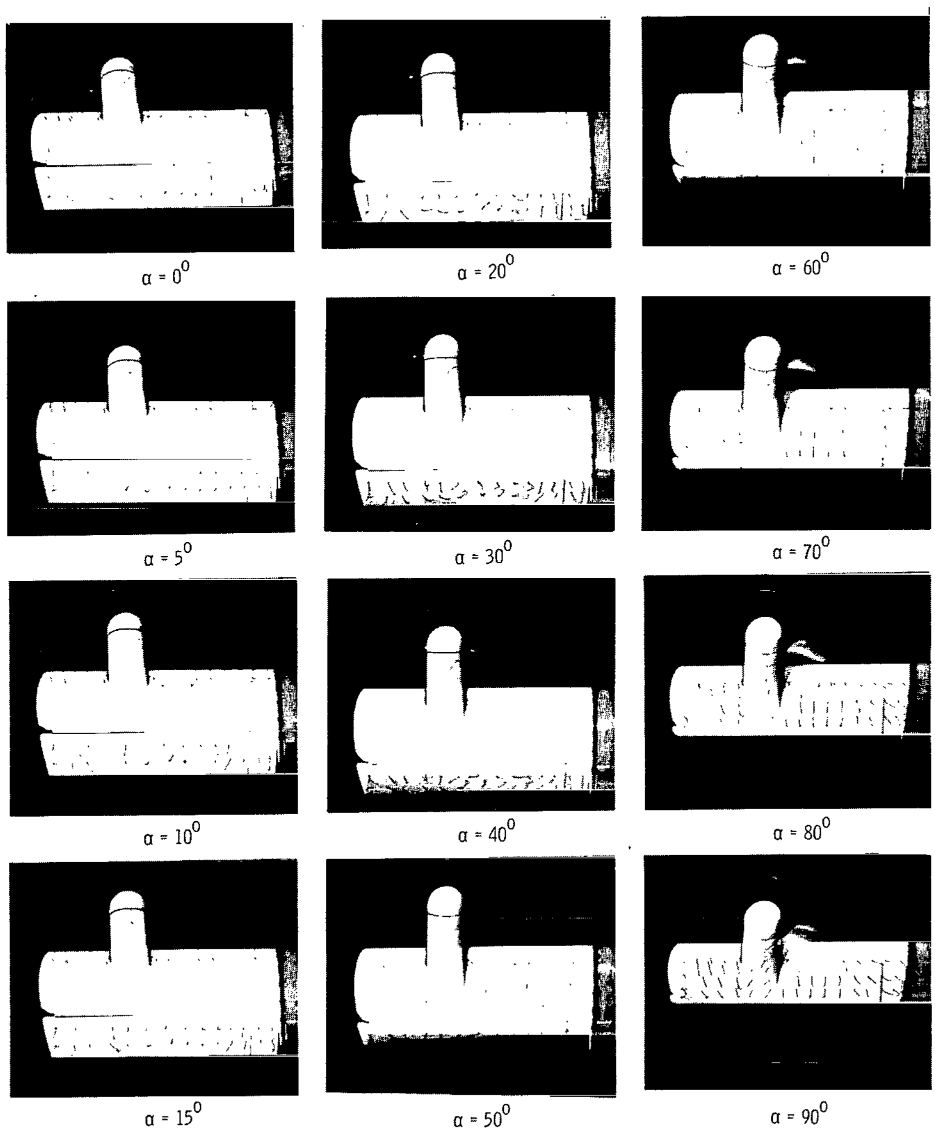
Figure 5.- Concluded.

L-64-7113



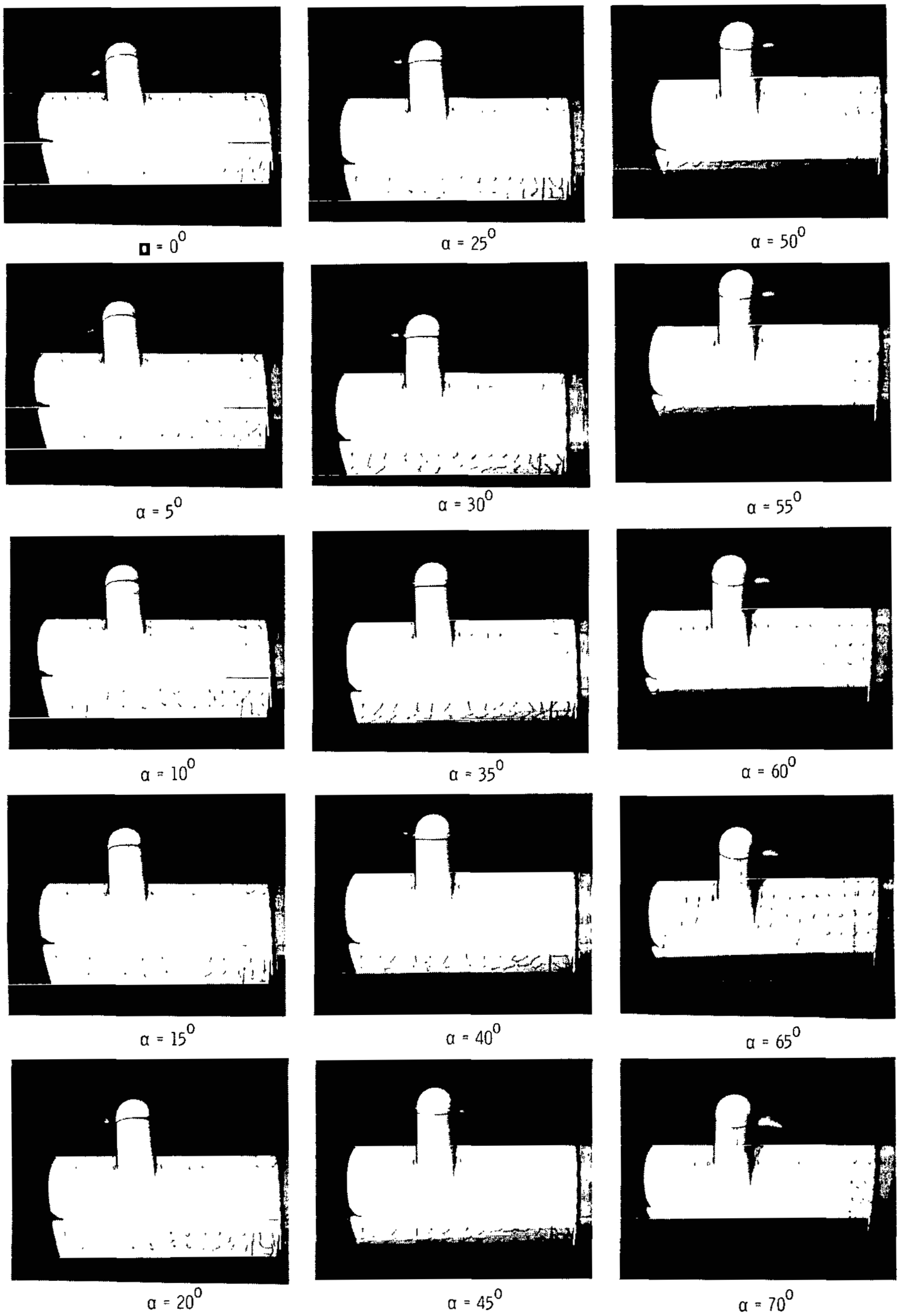
(a) Aerodynamic characteristics.

Figure 6.- Aerodynamic and flow characteristics of the model with the basic leading edge and with the trailing-edge flap deflected 40°.



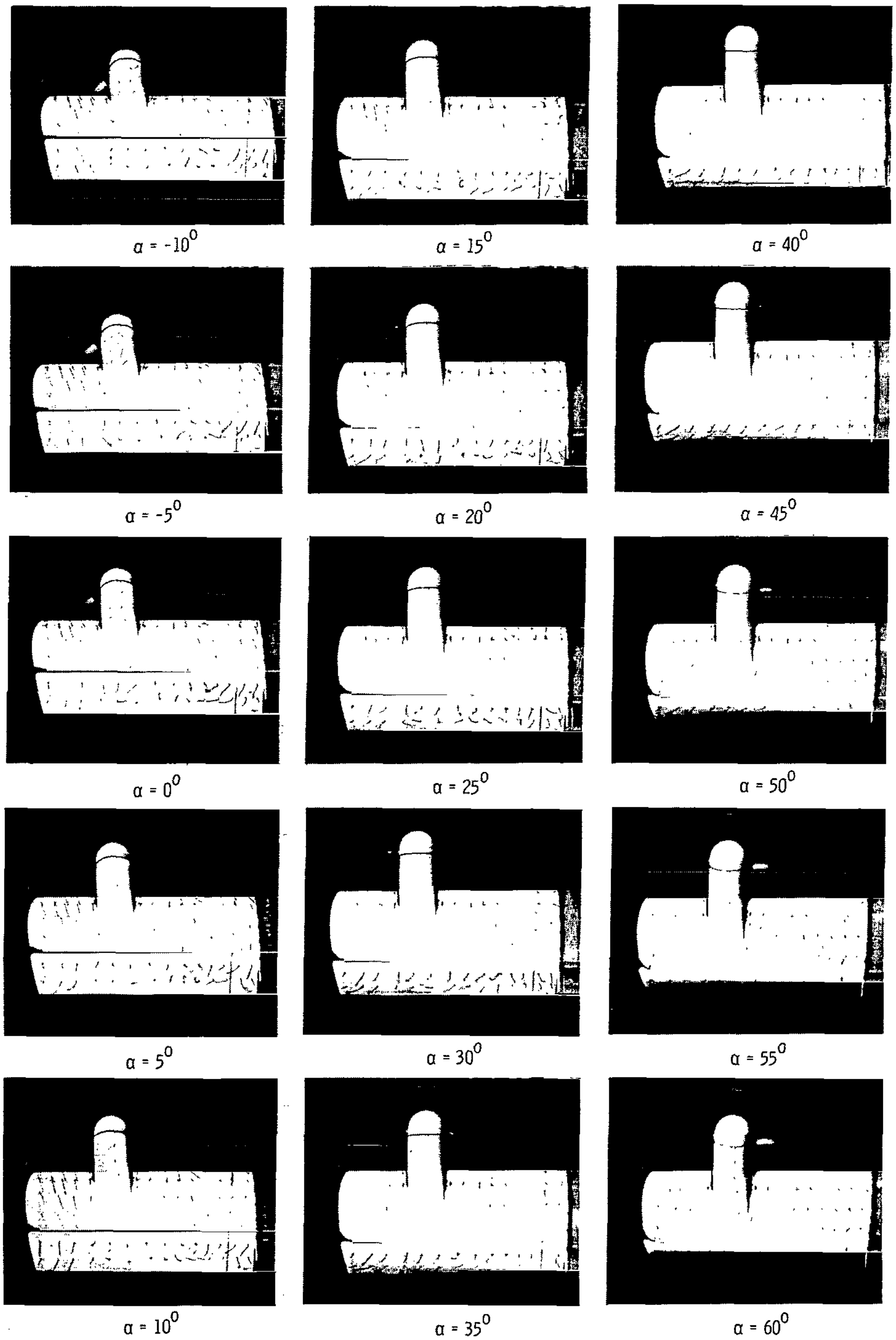
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7114

Figure 6.- Continued.



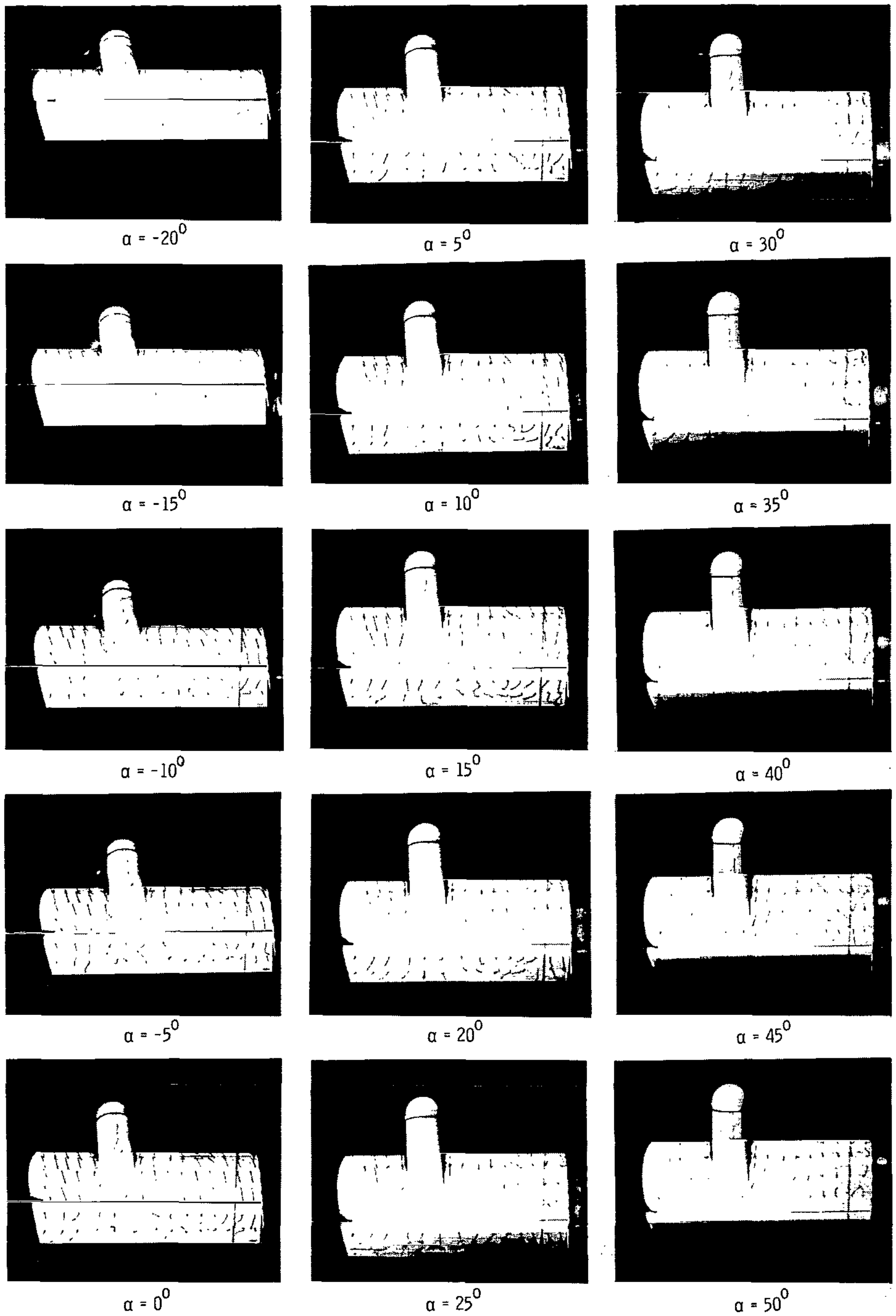
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7115

Figure 6.- Continued.



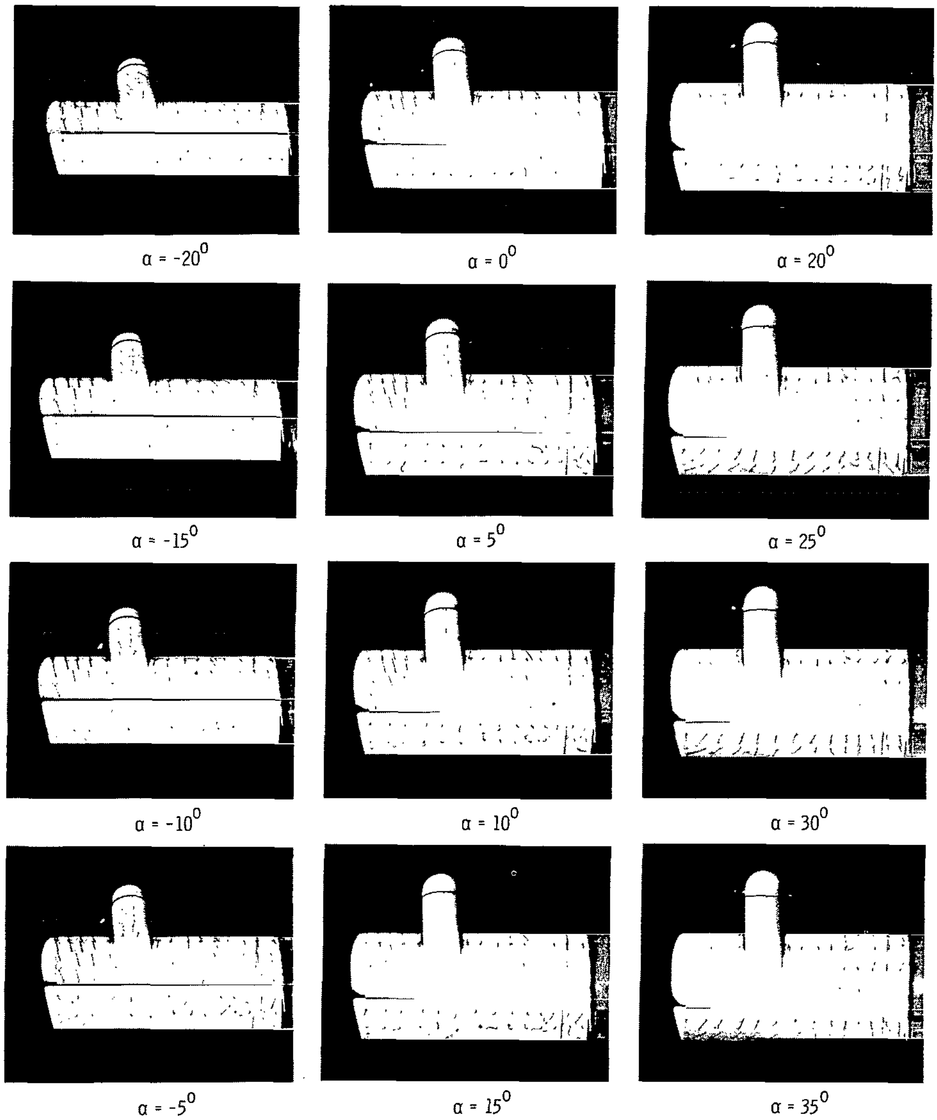
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7116

Figure 6.- Continued.



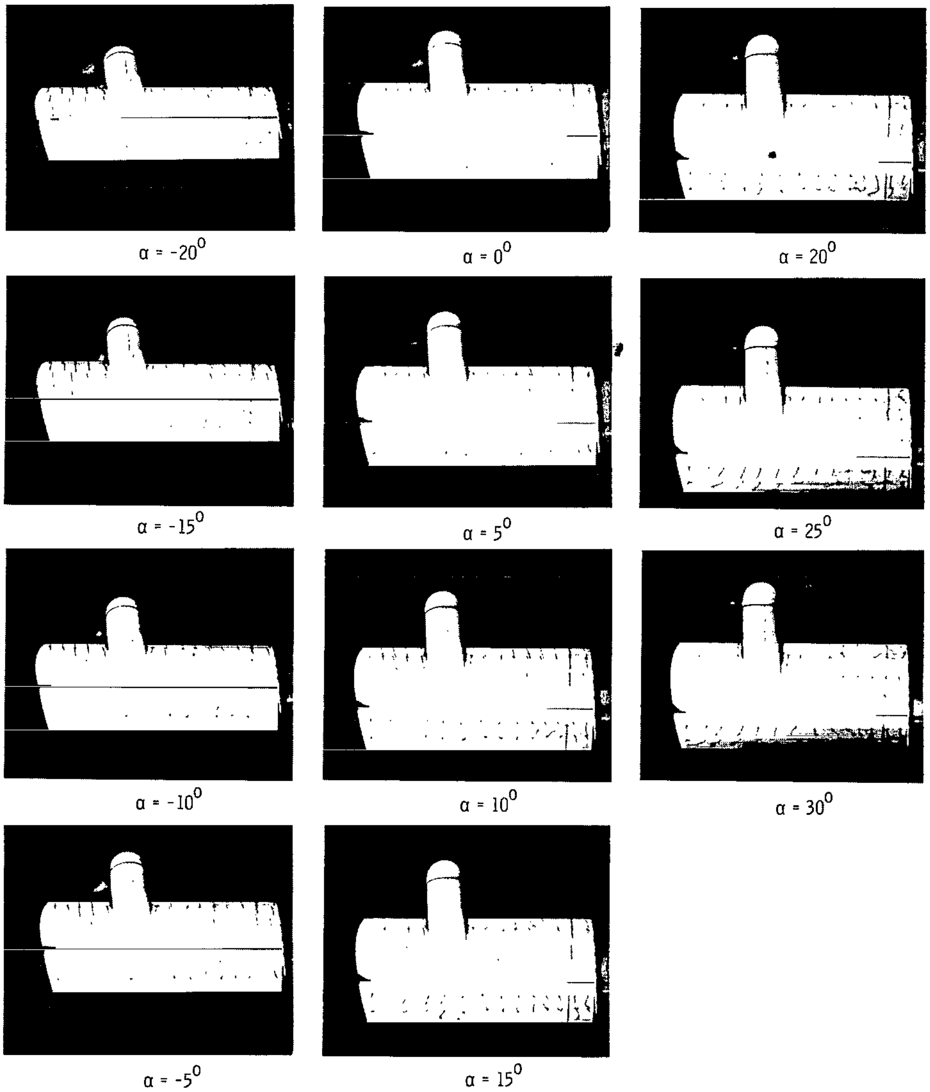
(e) Flow characteristics; $C_{T,s}$ = 0.80. L-64-7117

Figure 6.- Continued.



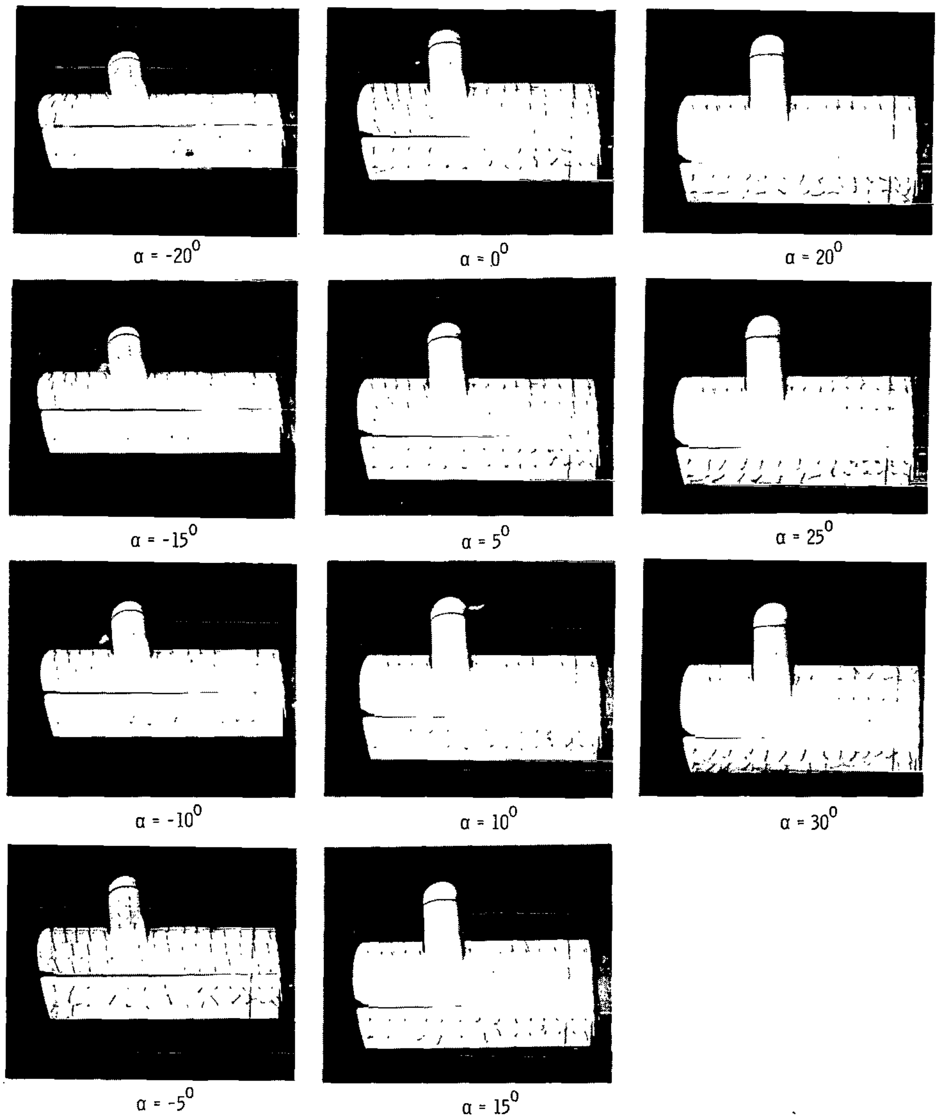
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7118

Figure 6.- Continued.



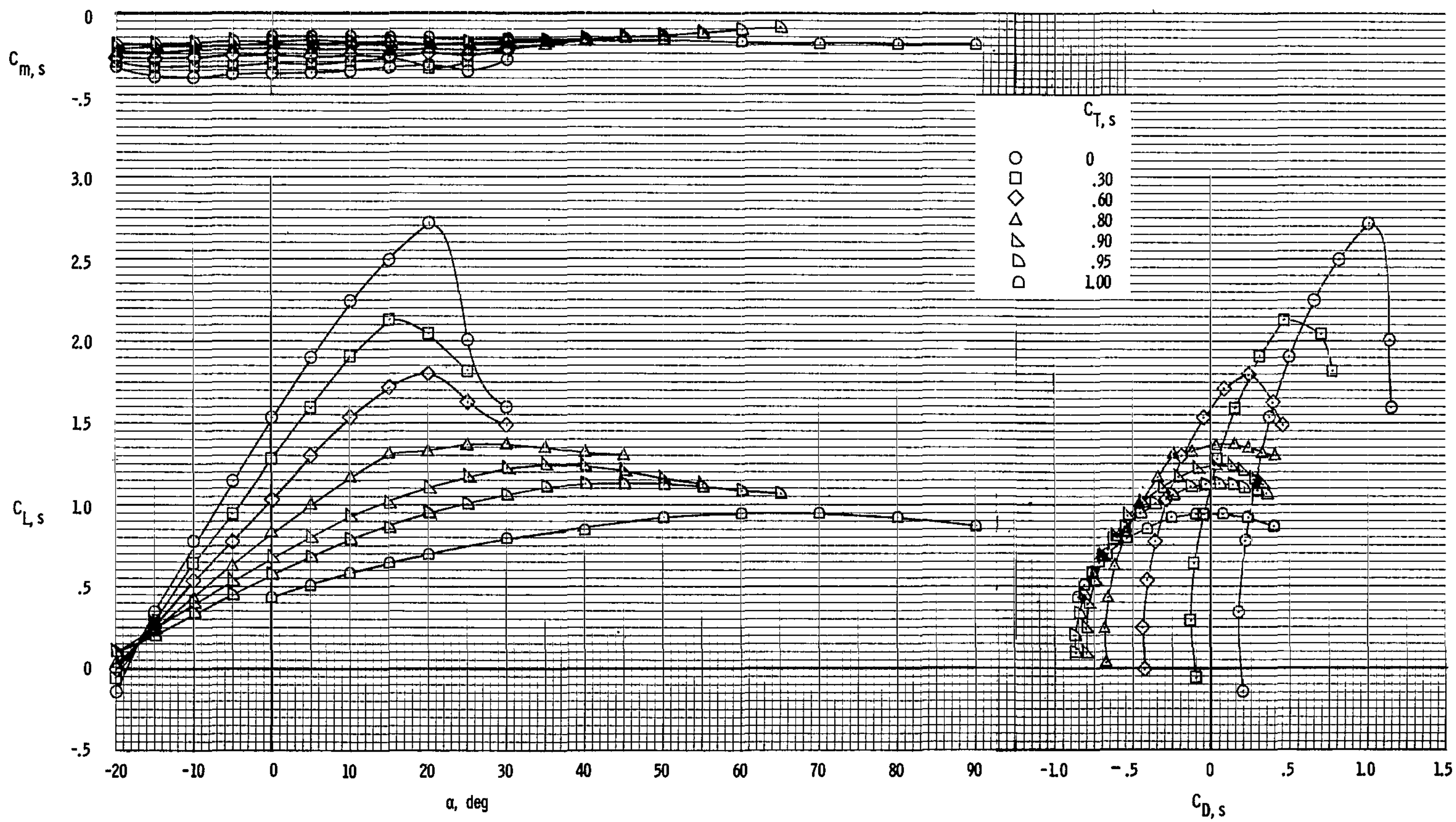
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7119

Figure 6.- Continued.



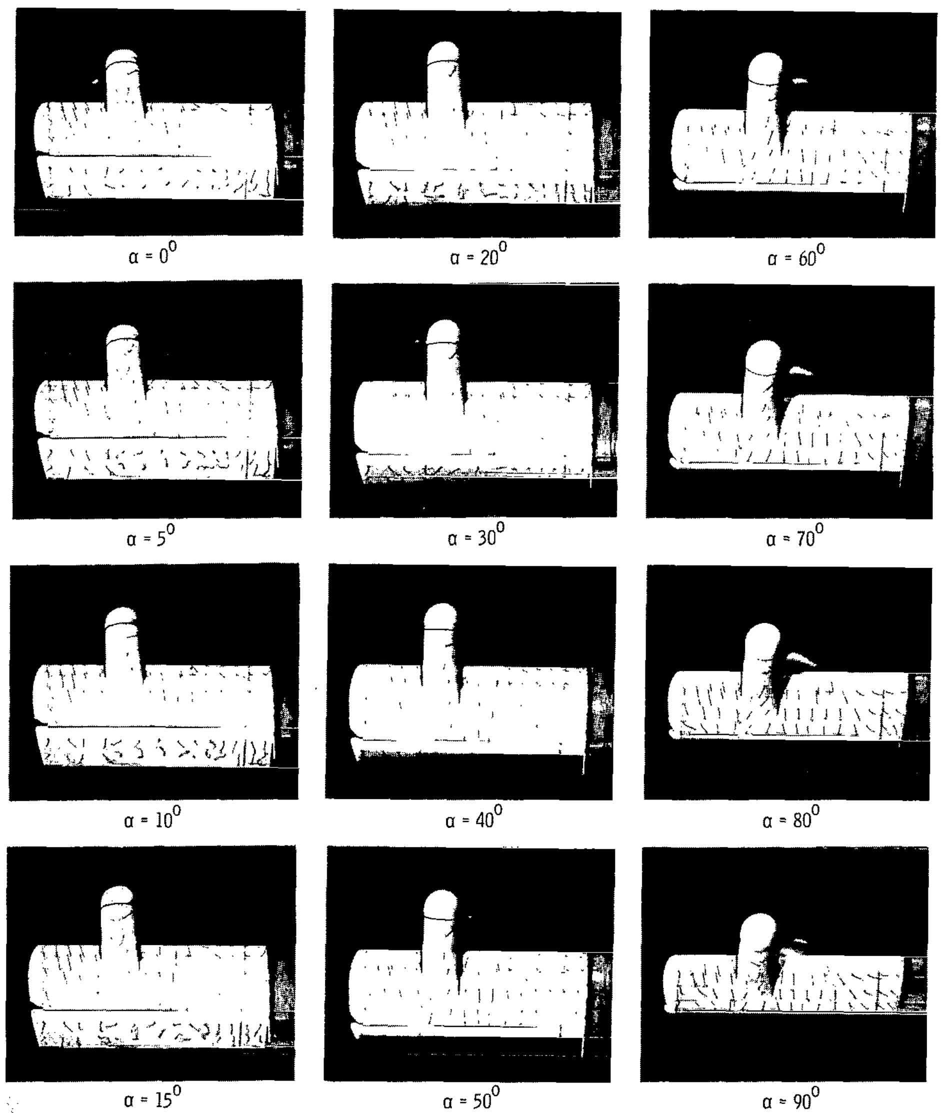
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7120

Figure 6.- Concluded.



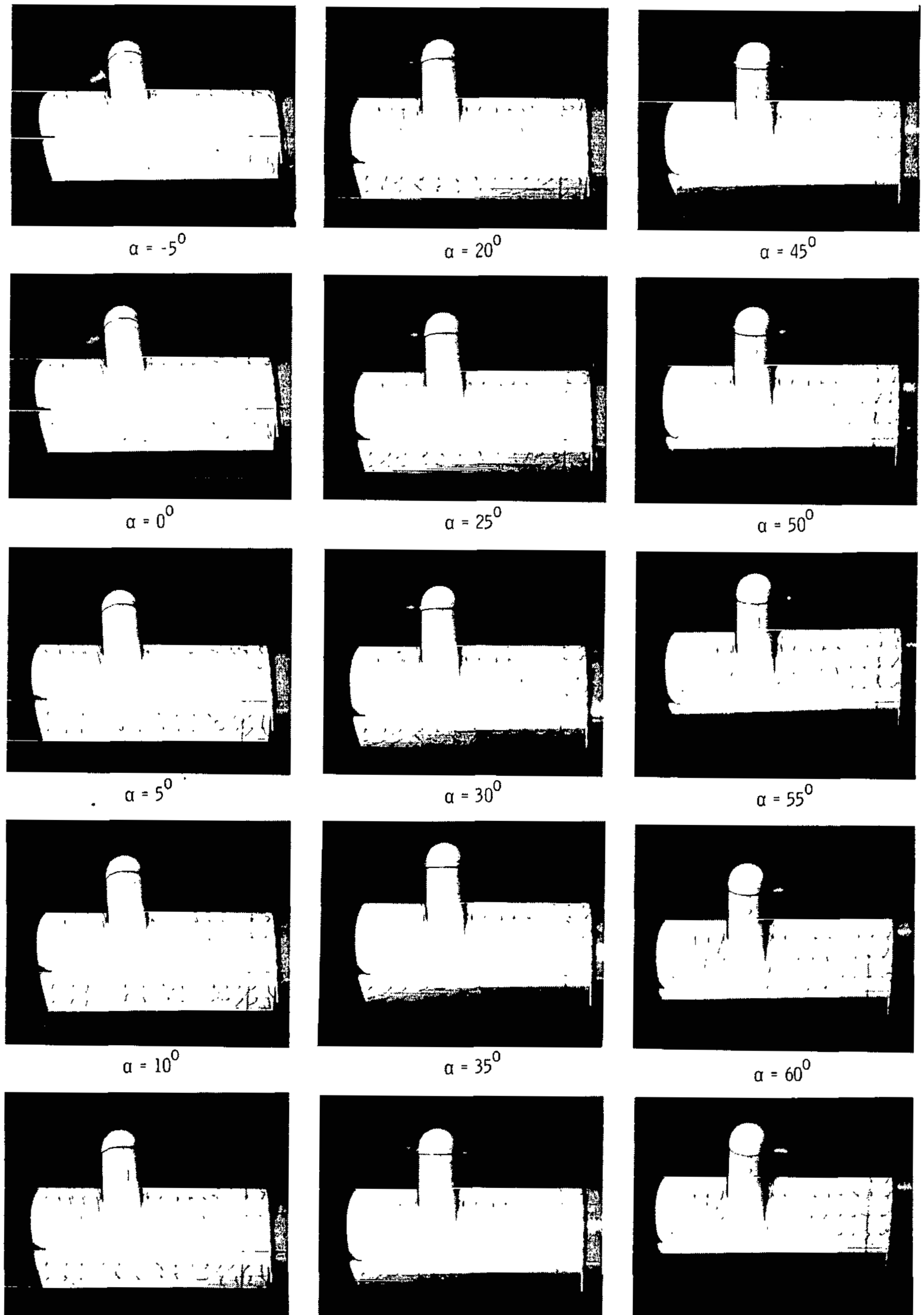
(a) Aerodynamic characteristics.

Figure 7.- Aerodynamic and flow characteristics of the model with the basic leading edge and with the trailing-edge flap deflected 50°.



(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7121

Figure 7.- Continued.



$\alpha = -5^0$ $\alpha = 20^0$ $\alpha = 45^0$

$\alpha = 0^0$ $\alpha = 25^0$ $\alpha = 50^0$

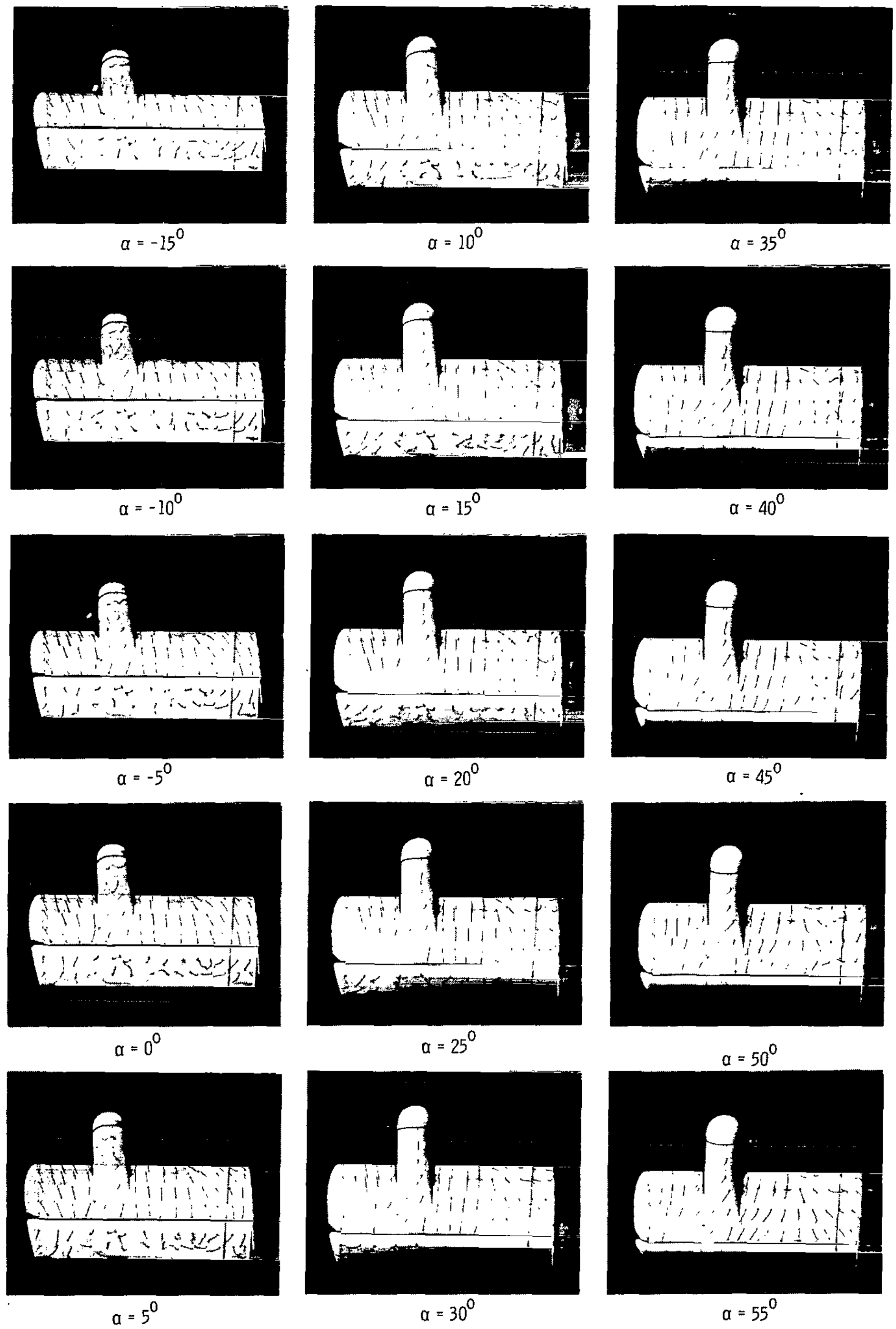
$\alpha = 5^0$ $\alpha = 30^0$ $\alpha = 55^0$

$\alpha = 10^0$ $\alpha = 35^0$ $\alpha = 60^0$

$\alpha = 15^0$ $\alpha = 40^0$ $\alpha = 65^0$

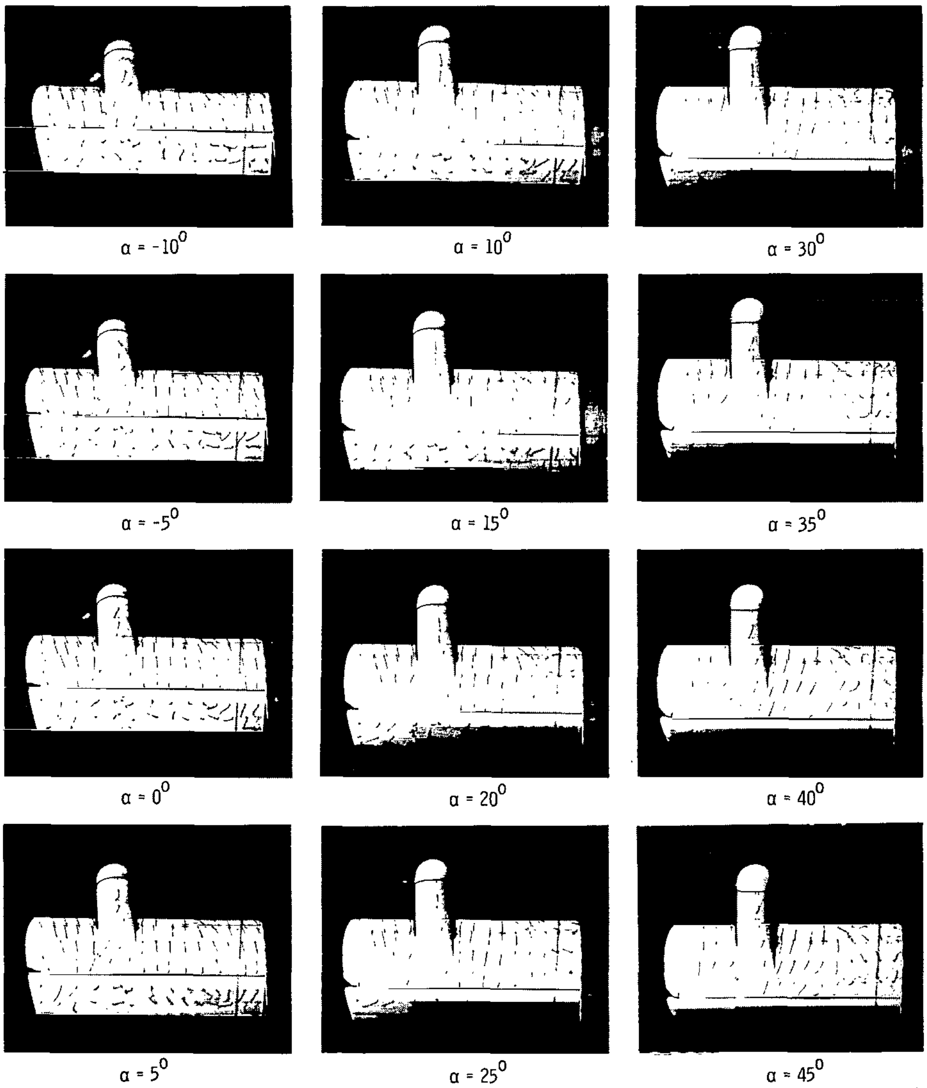
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7122

Figure 7.- Continued.



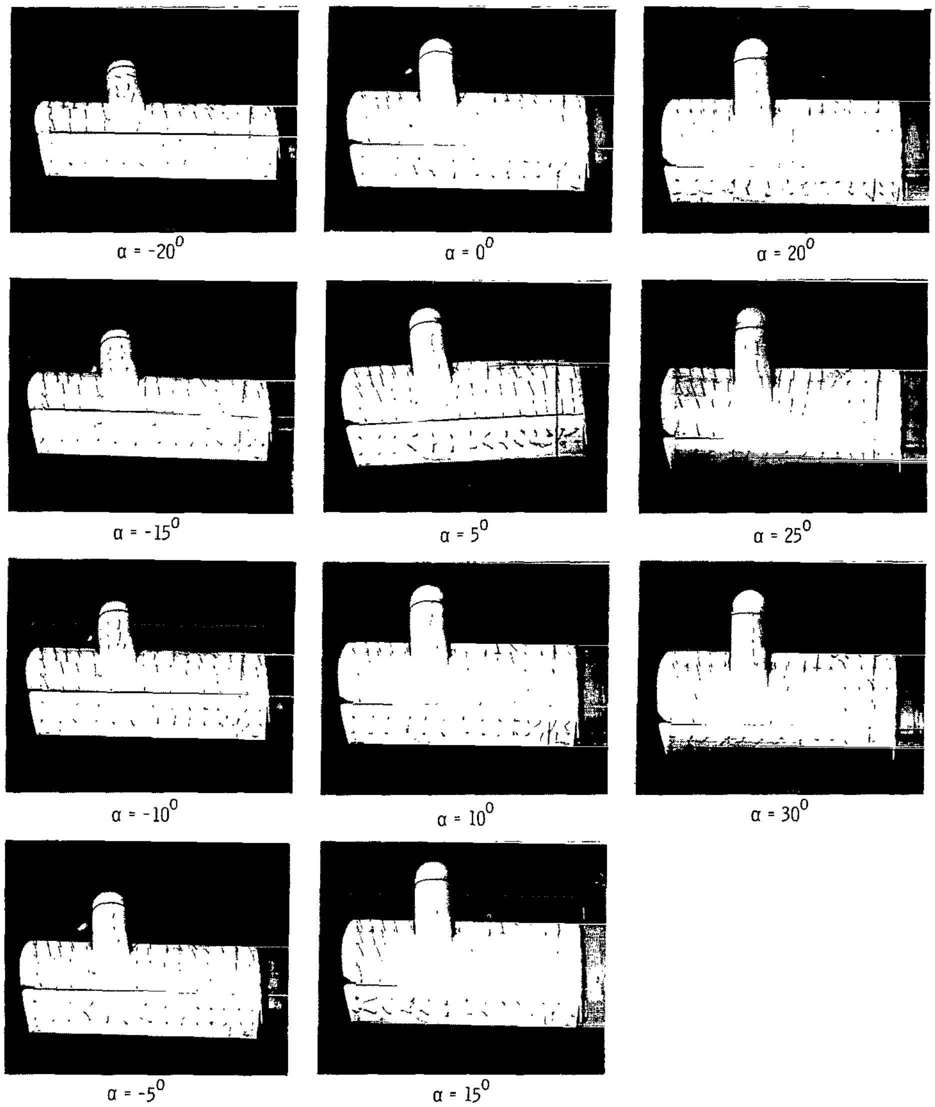
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7123

Figure 7.- Continued.



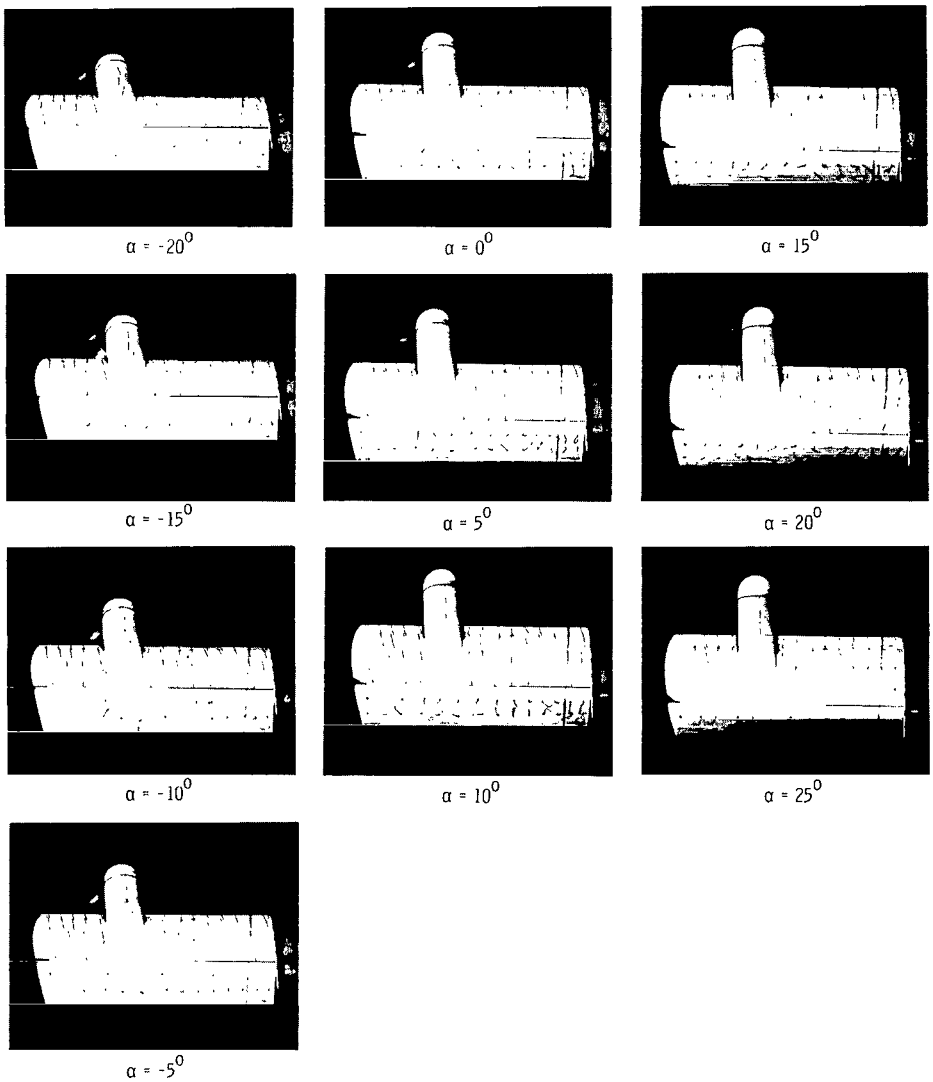
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7124

Figure 7.- Continued.



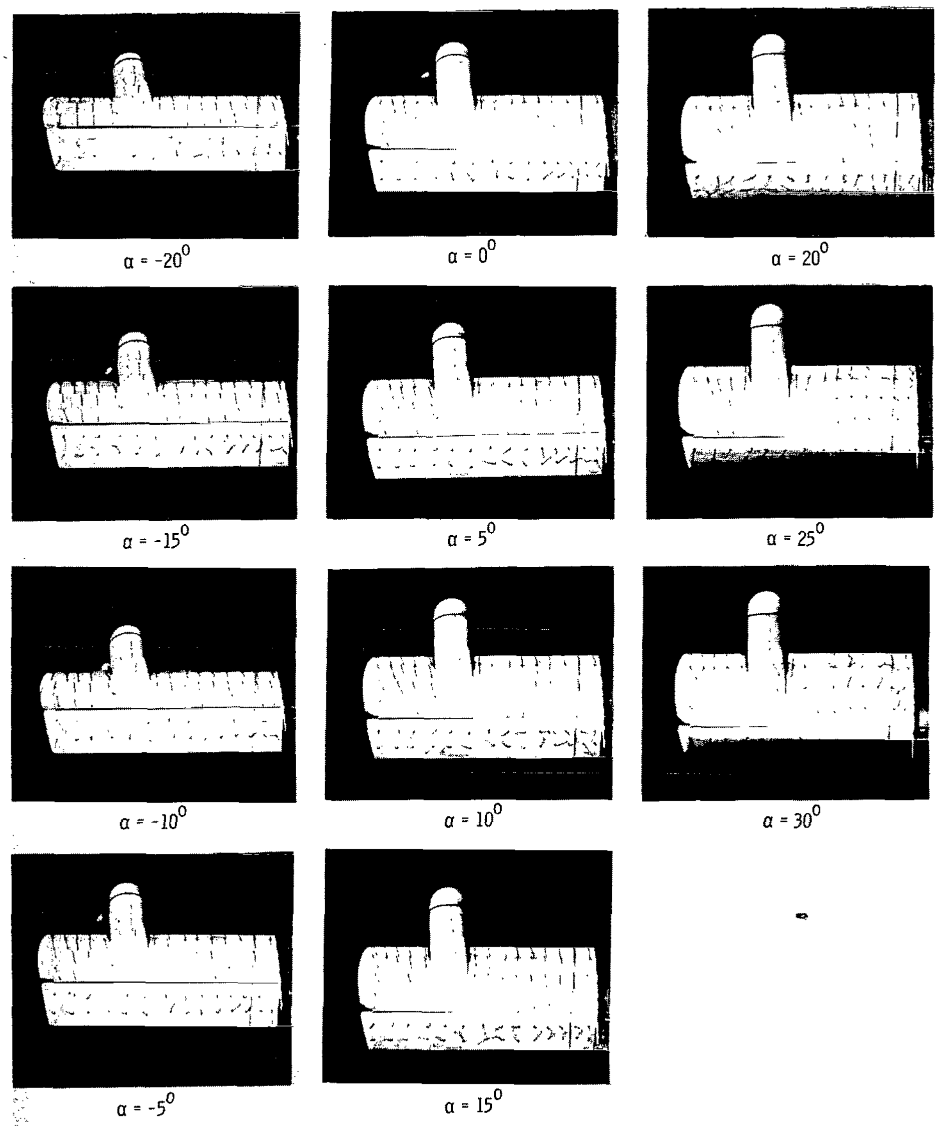
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7125

Figure 7.- Continued.



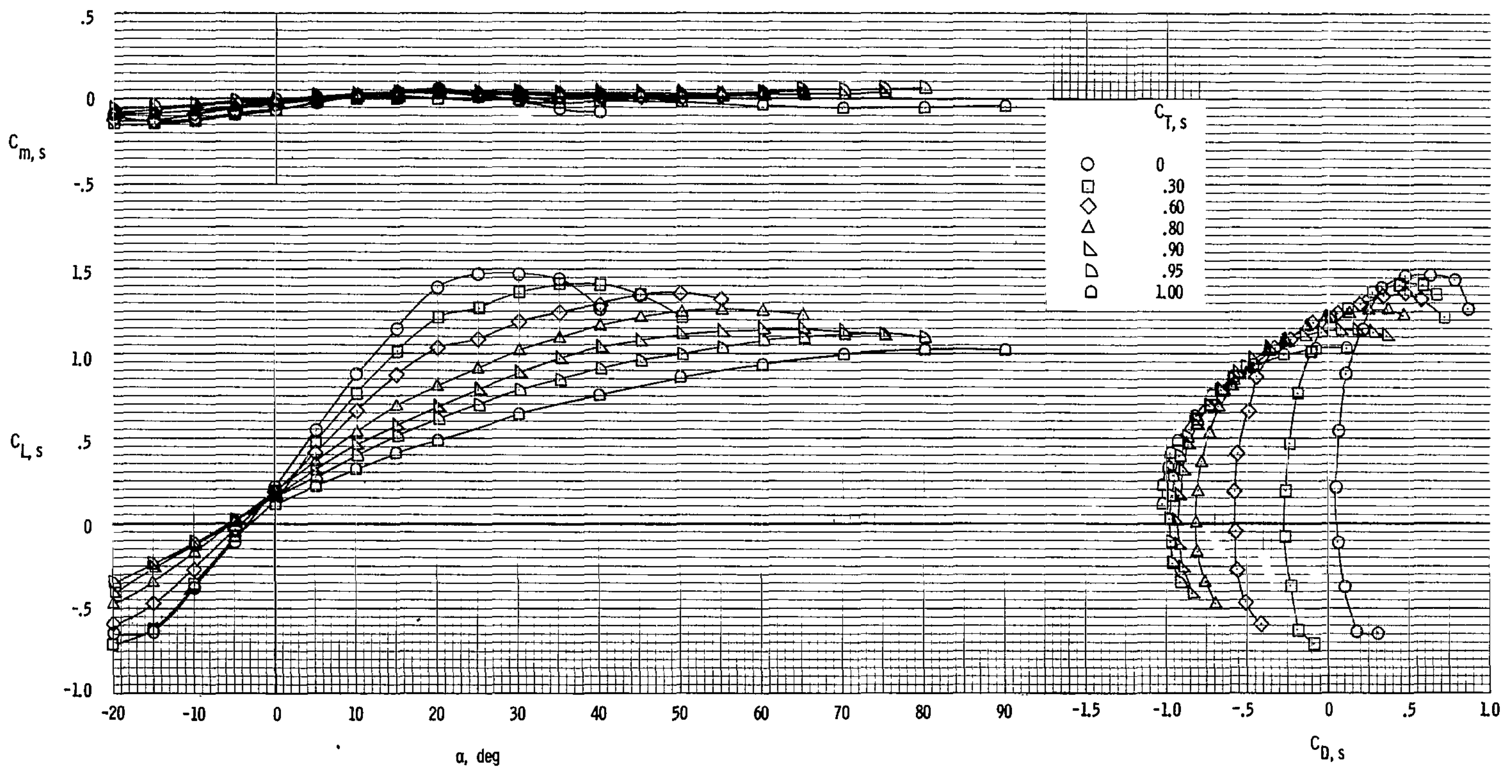
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7126

Figure 7.- Continued.



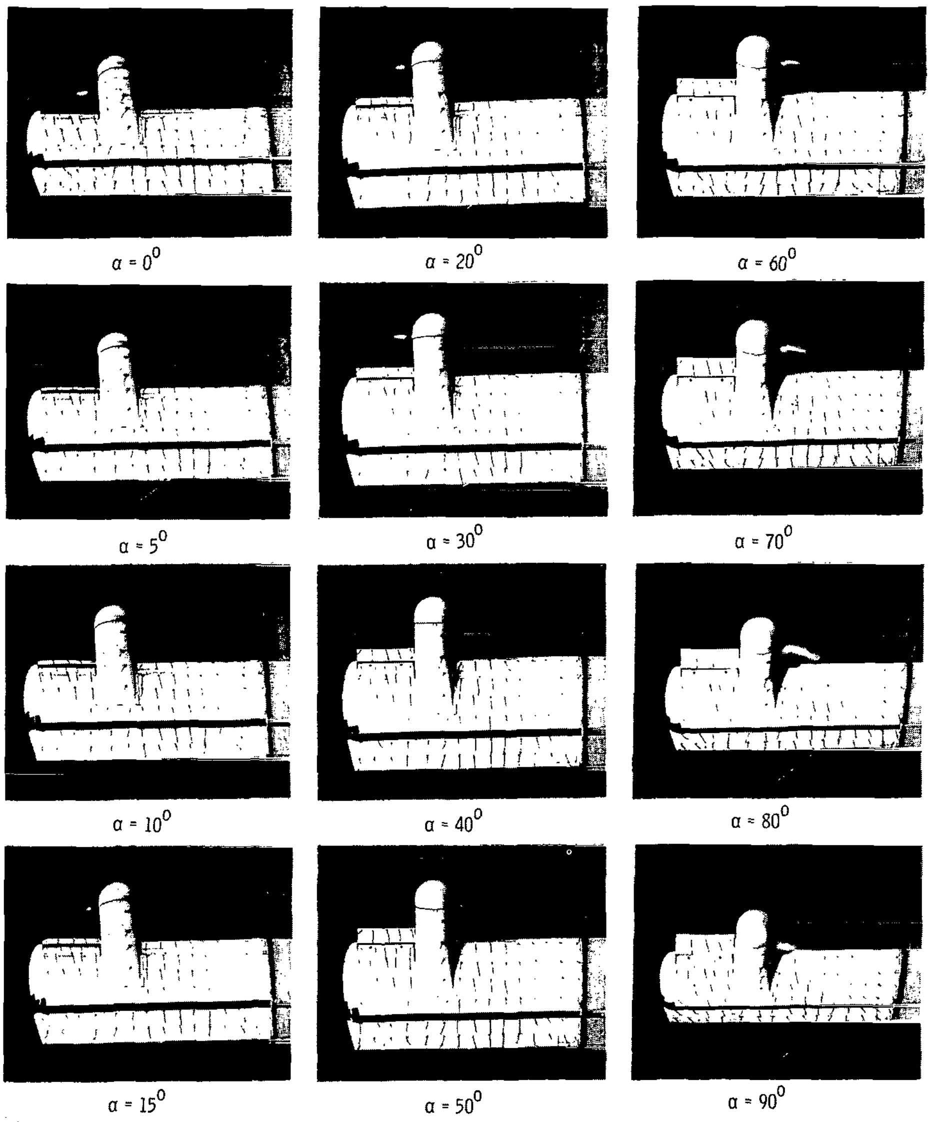
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7127

Figure 7.- Concluded.



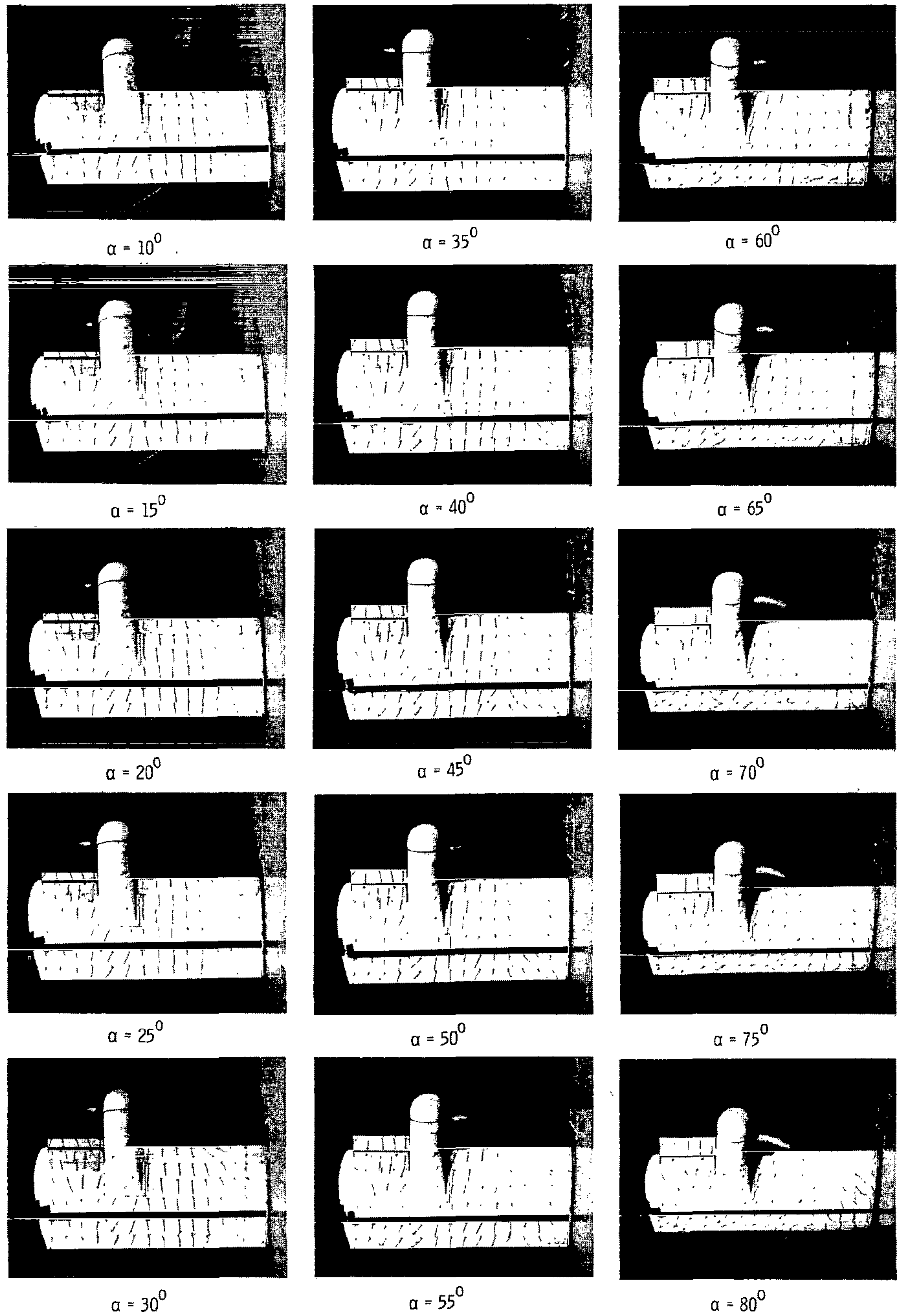
(a) Aerodynamic characteristics.

Figure 8.- Aerodynamic and flow characteristics of the model with the outboard section of the slat deflected 20° and with the trailing-edge flap undeflected. $\delta_f = 0°$.



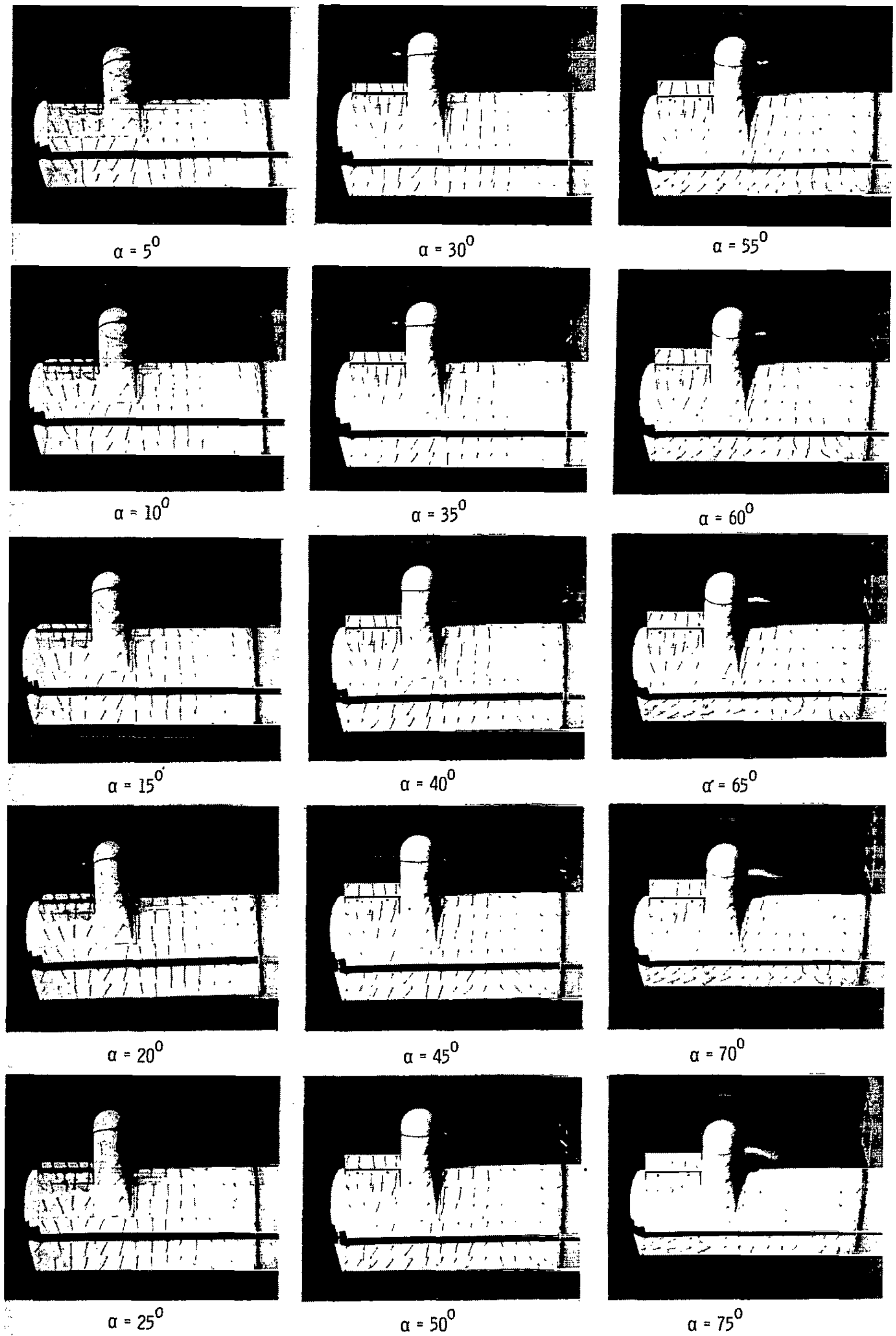
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7128

Figure 8.- Continued.



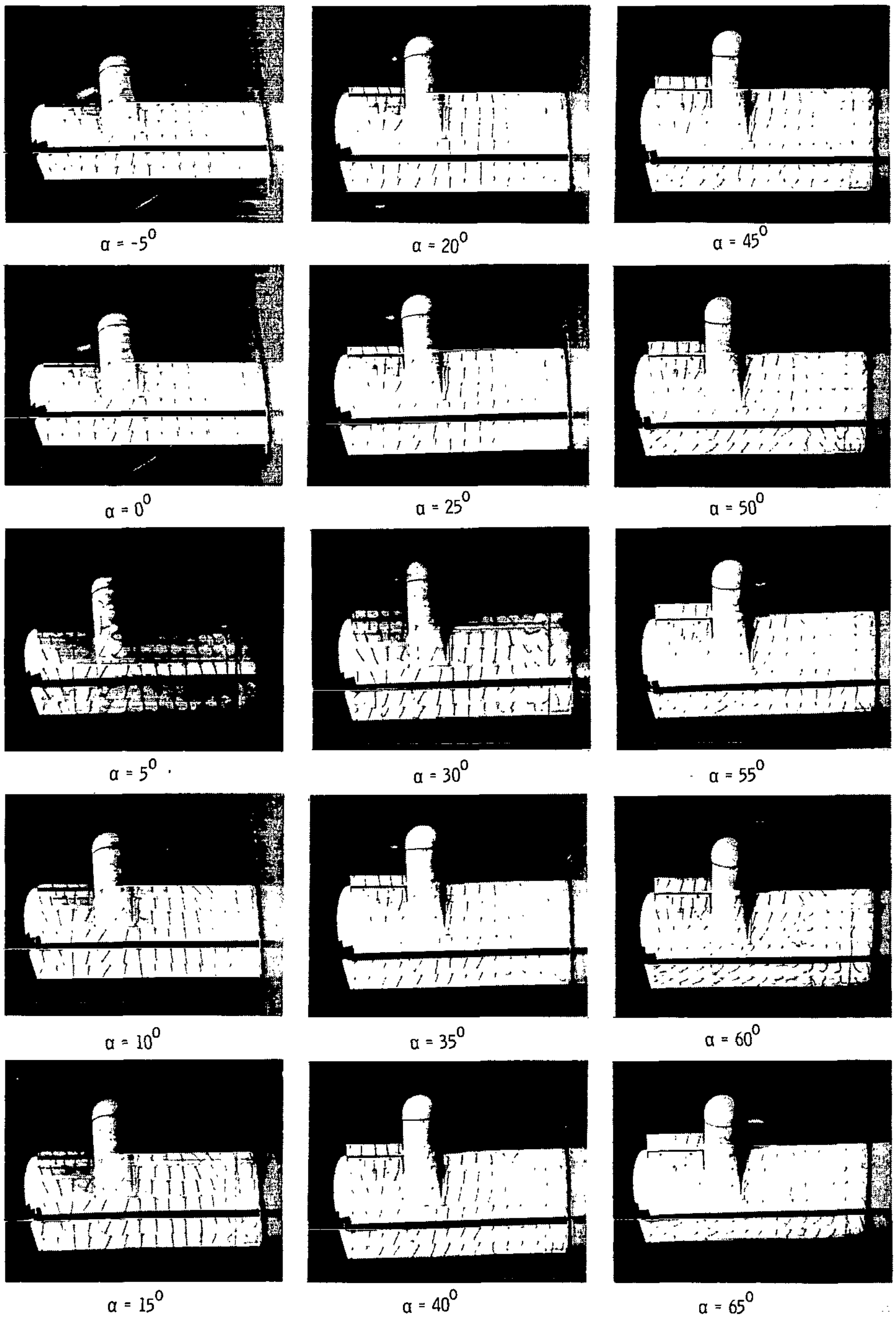
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7129

Figure 8.- Continued.



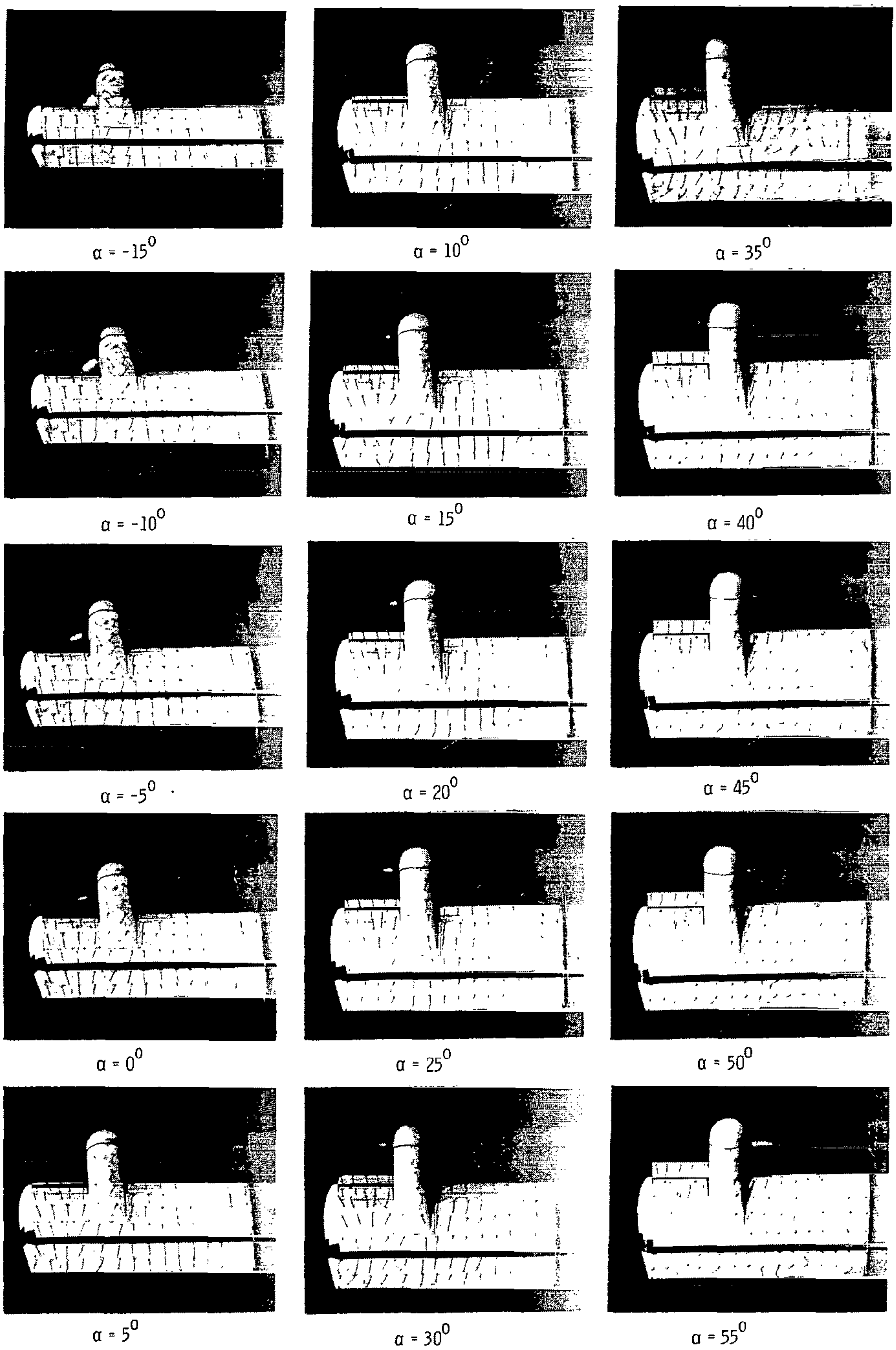
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7130

Figure 8.- Continued.



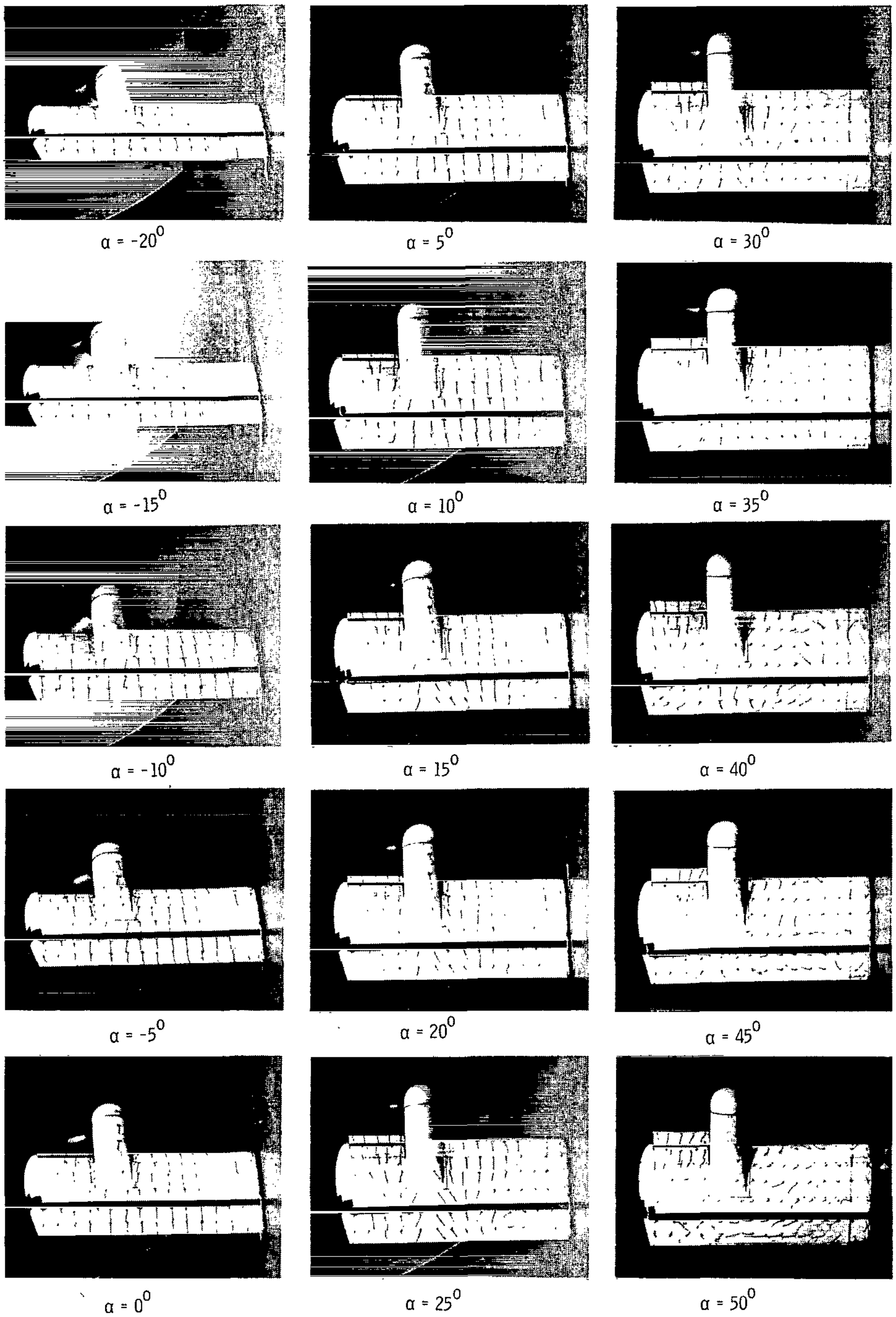
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7131

Figure 8.- Continued.



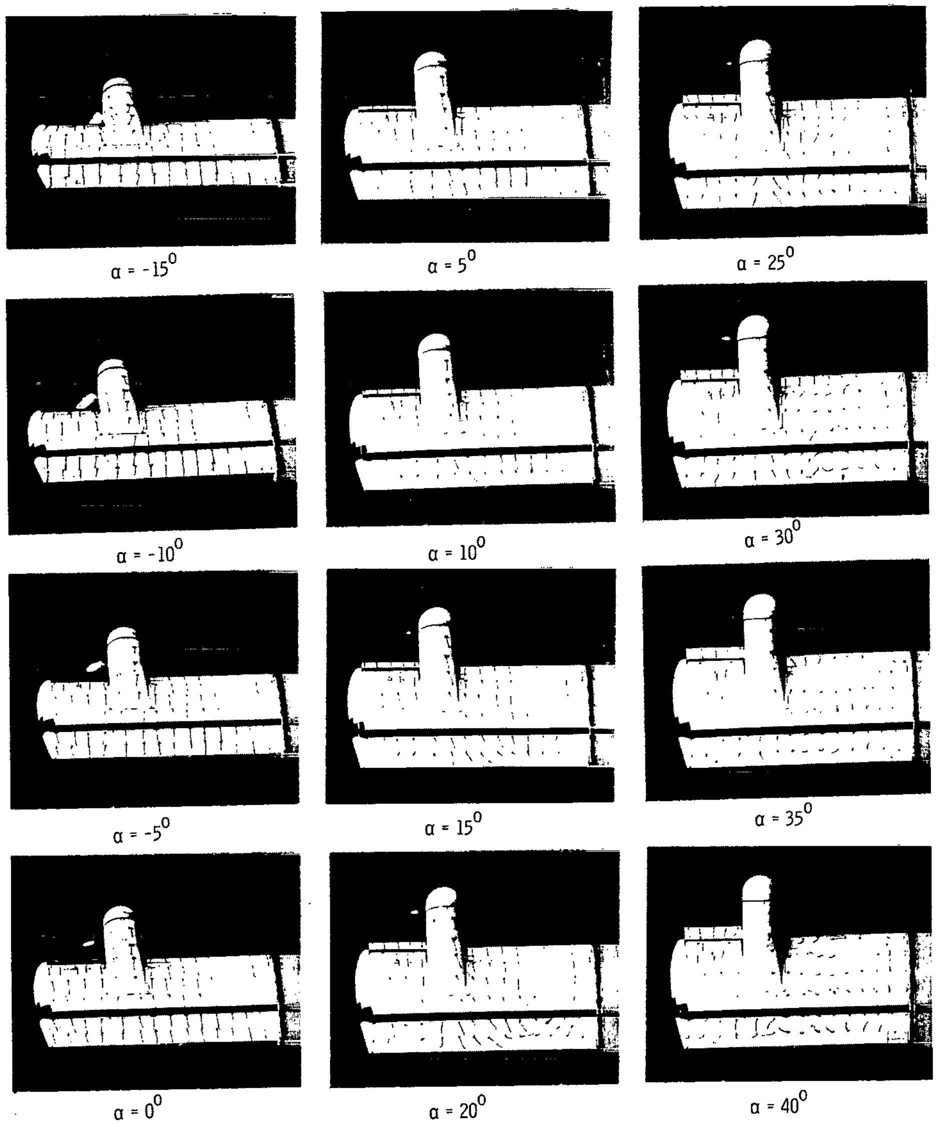
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7132

Figure 8.- Continued.



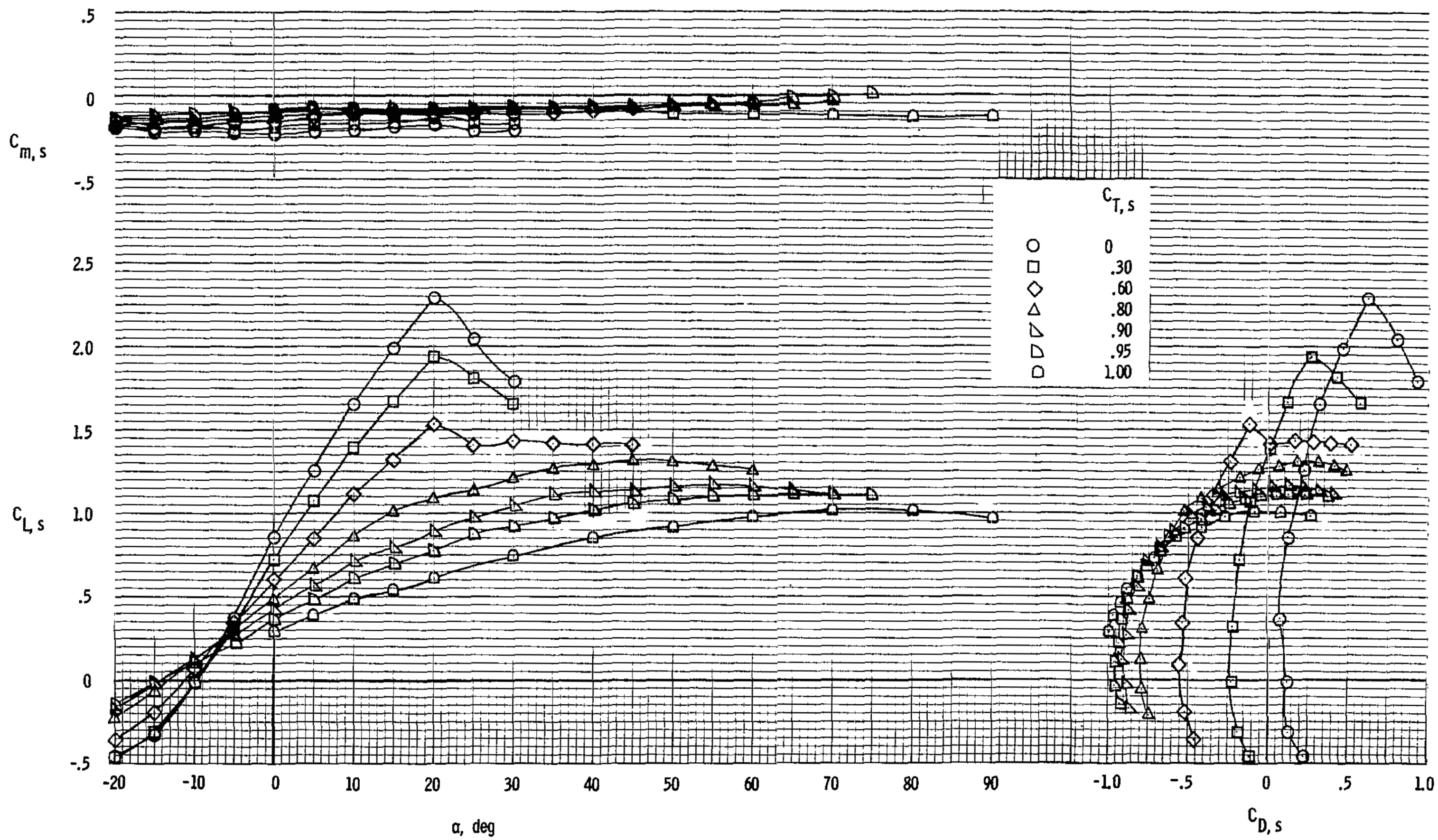
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7133

Figure 8.- Continued.



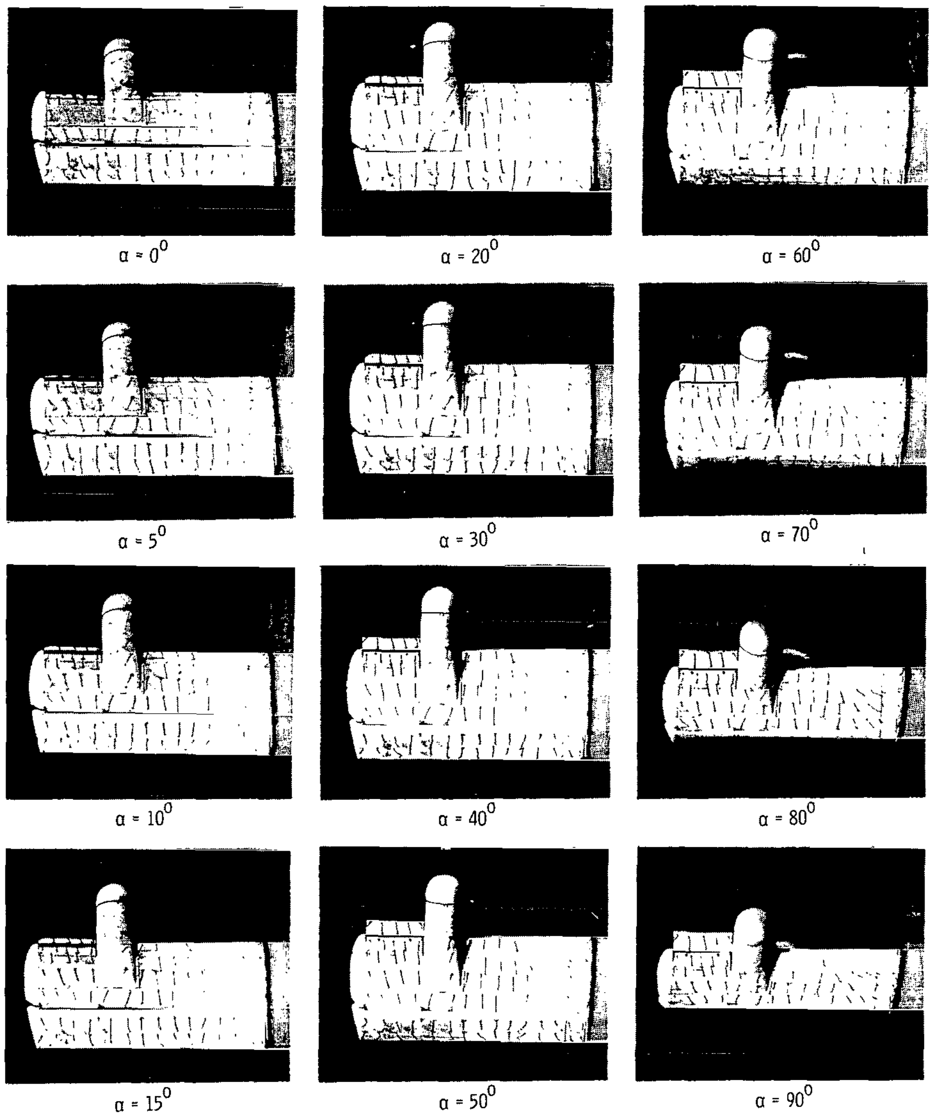
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7134

Figure 8.- Concluded.



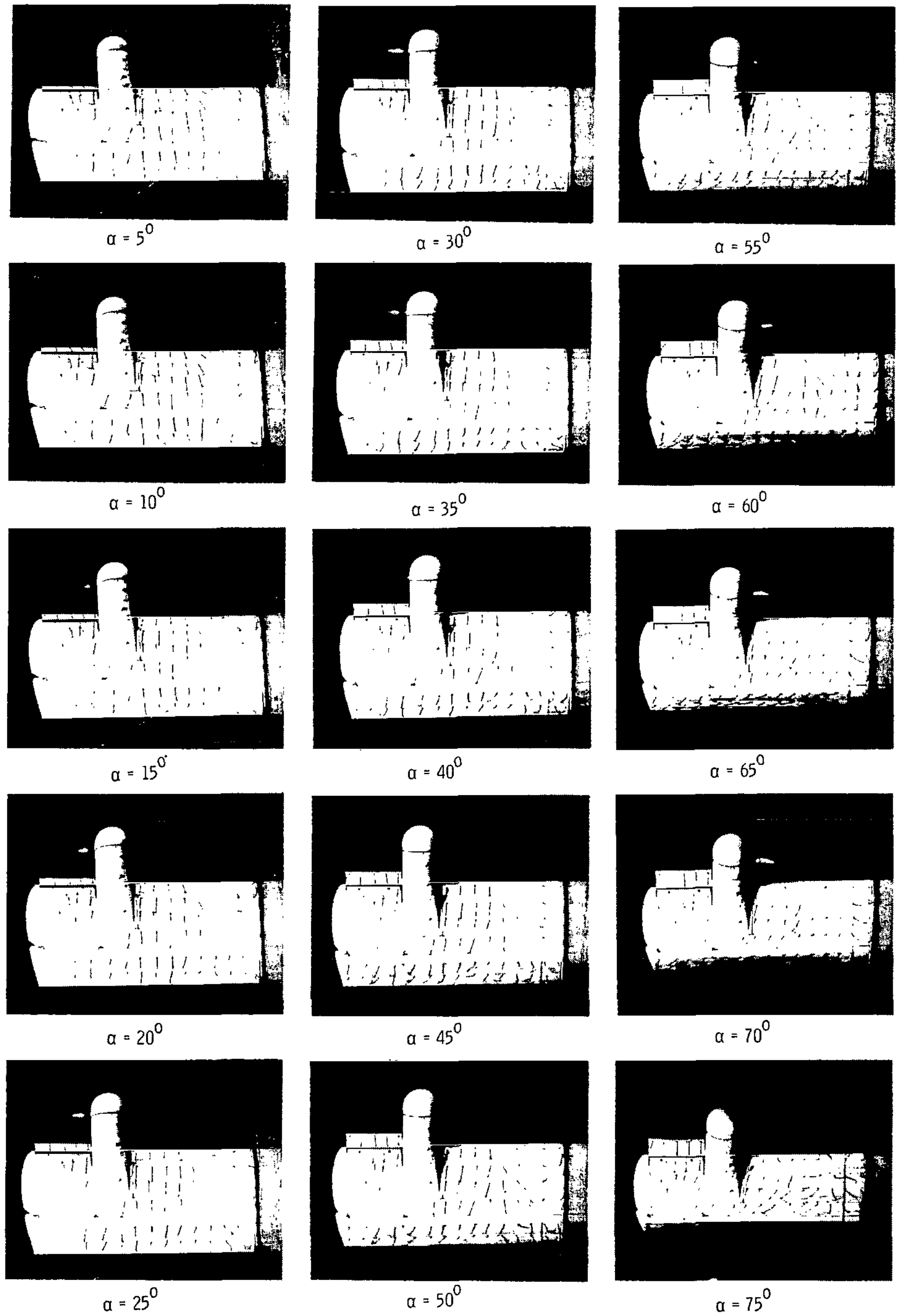
(a) Aerodynamic characteristics.

Figure 9.- Aerodynamic and flow characteristics of the model with the outboard section of the slat deflected 20° and with the trailing-edge flap deflected 20°.



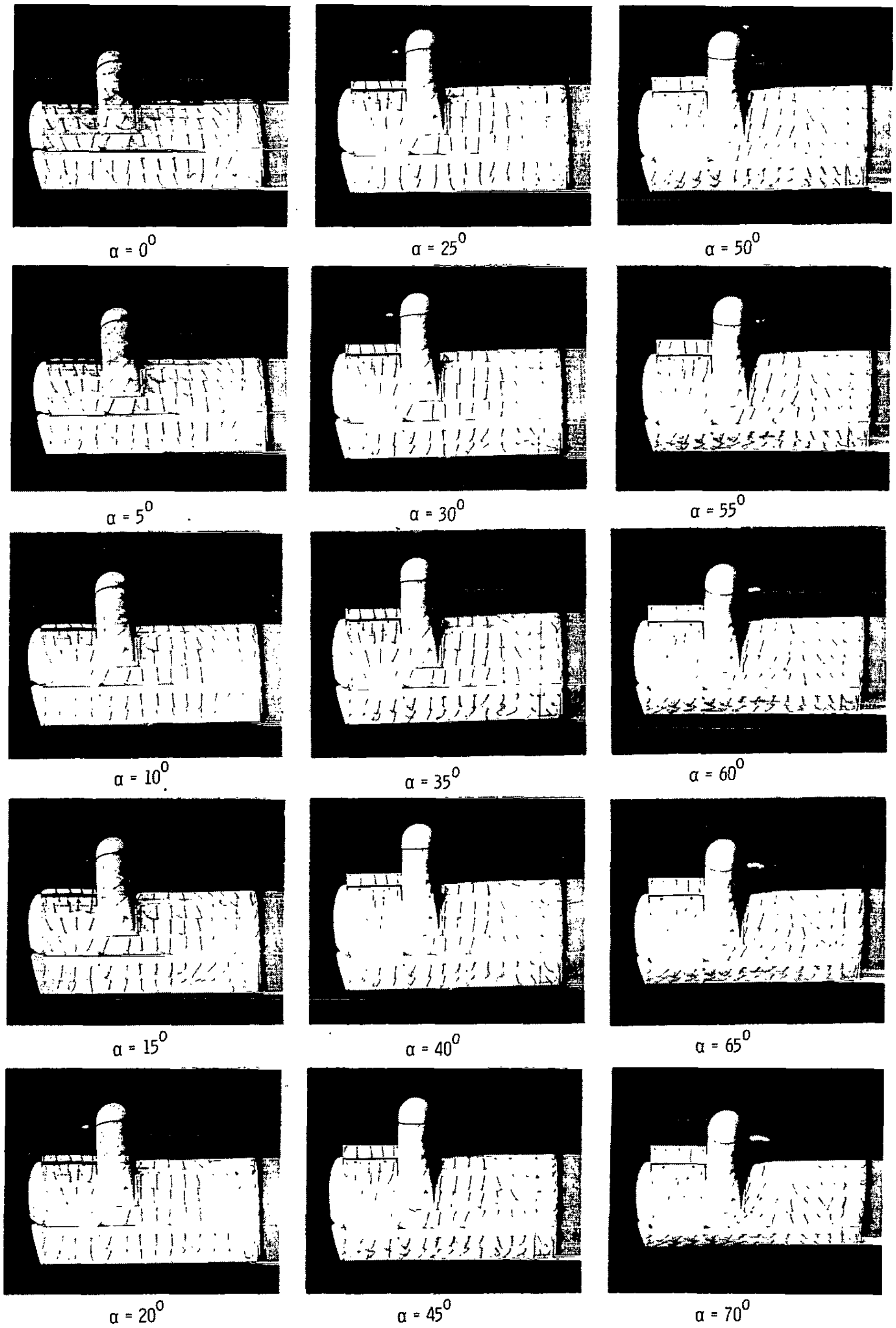
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7135

Figure 9.- Continued.



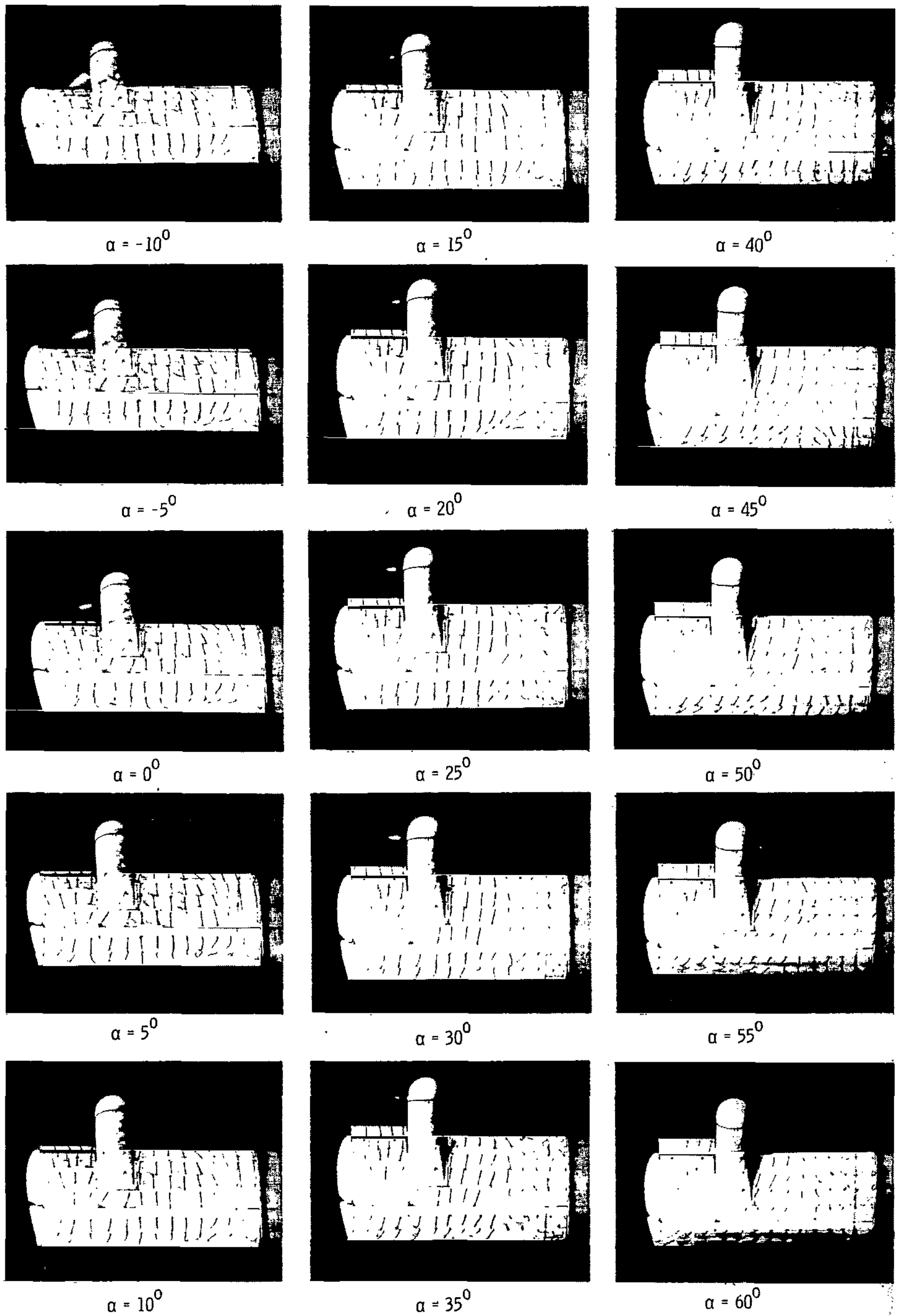
(c) Flow characteristics; $C_{T,s}$ = 0.95. L-64-7136

Figure 9.- Continued.



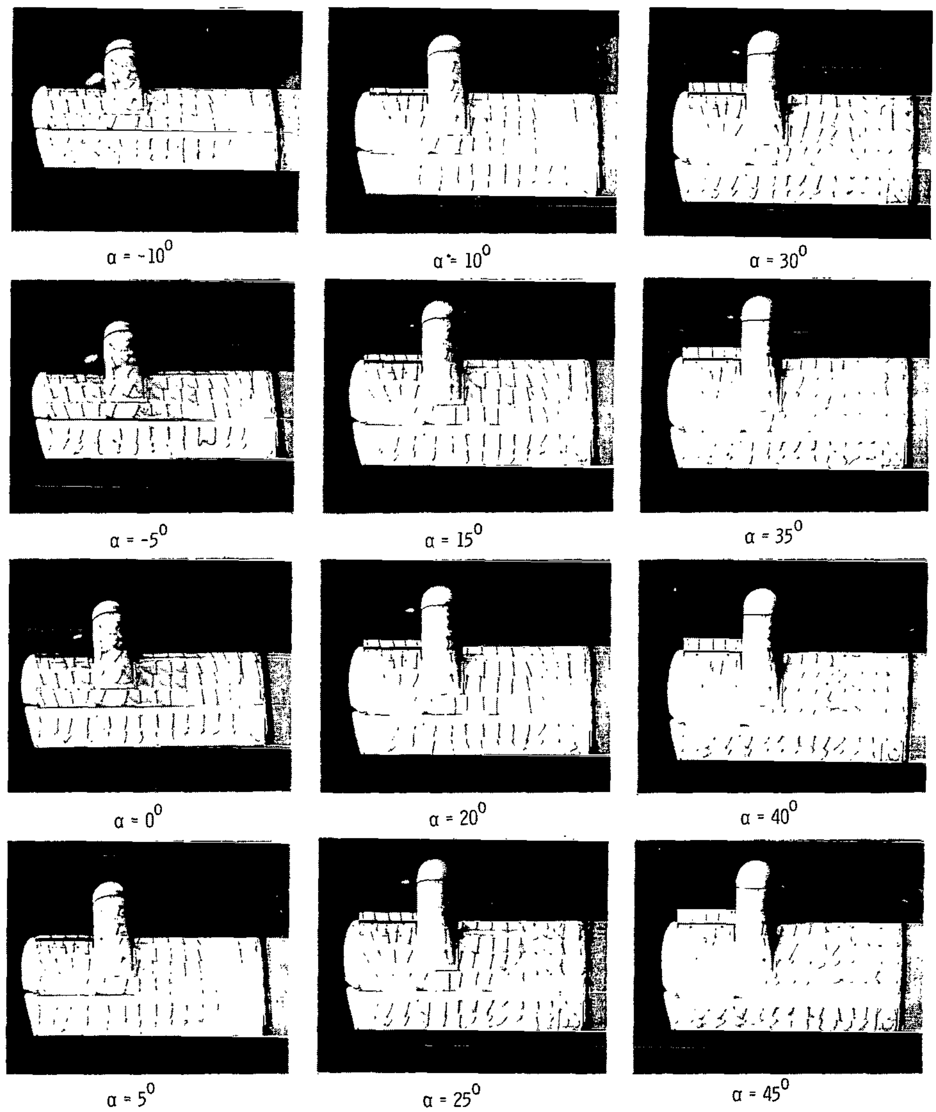
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7137

Figure 9.- Continued.



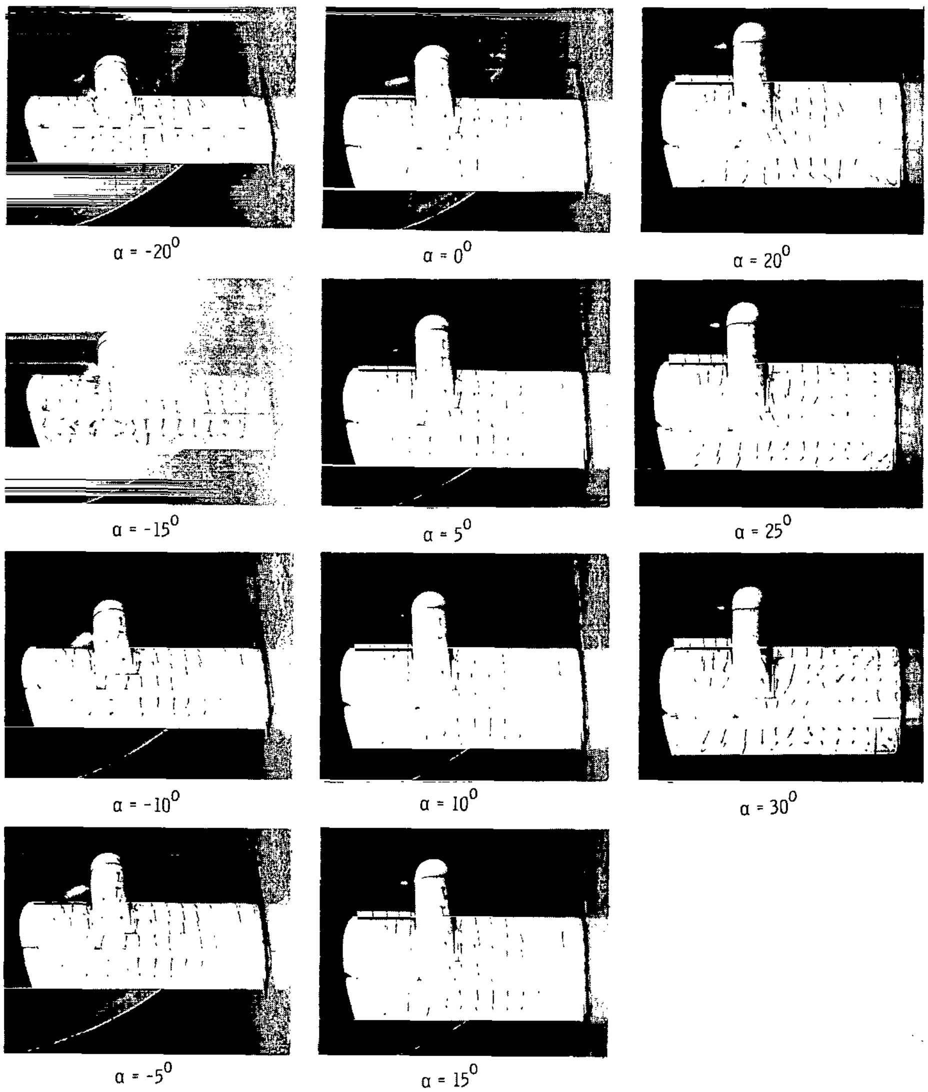
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7138

Figure 9.- Continued.



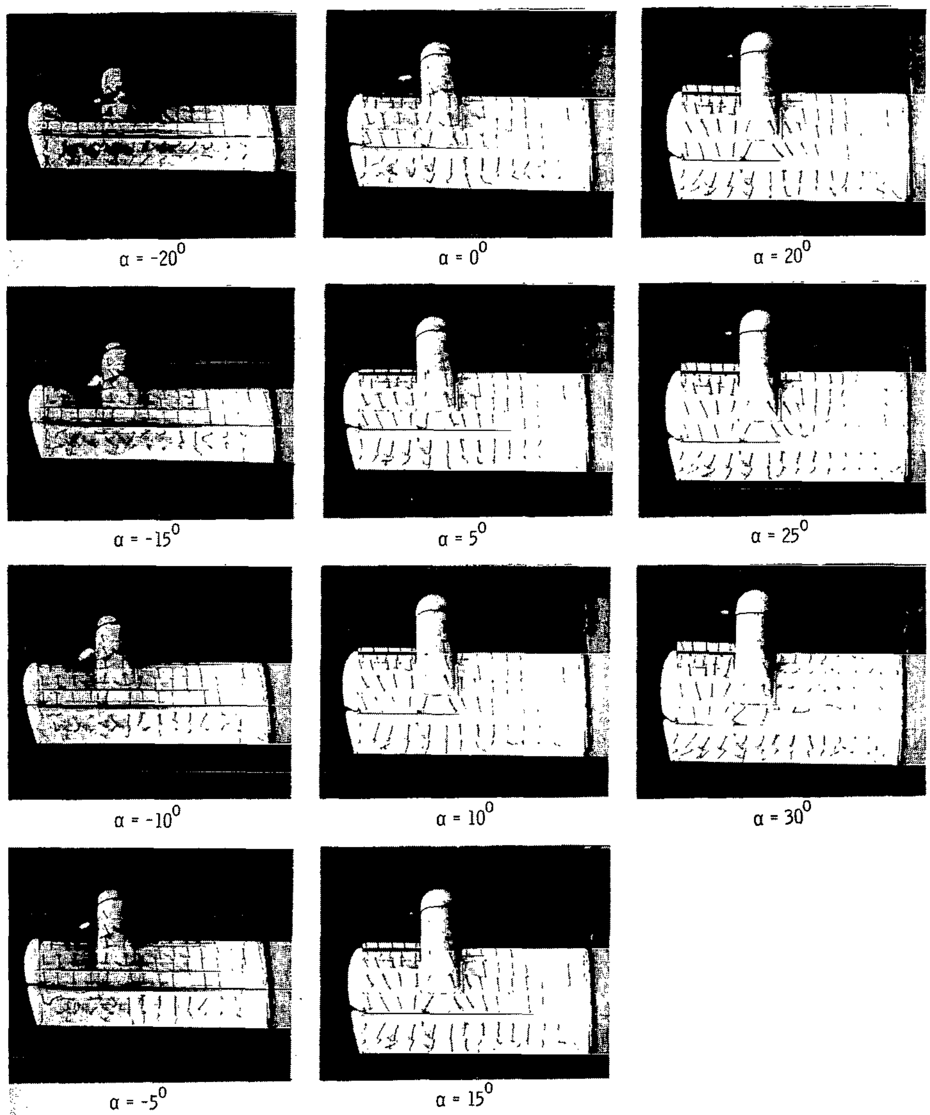
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7139

Figure 9.- Continued.



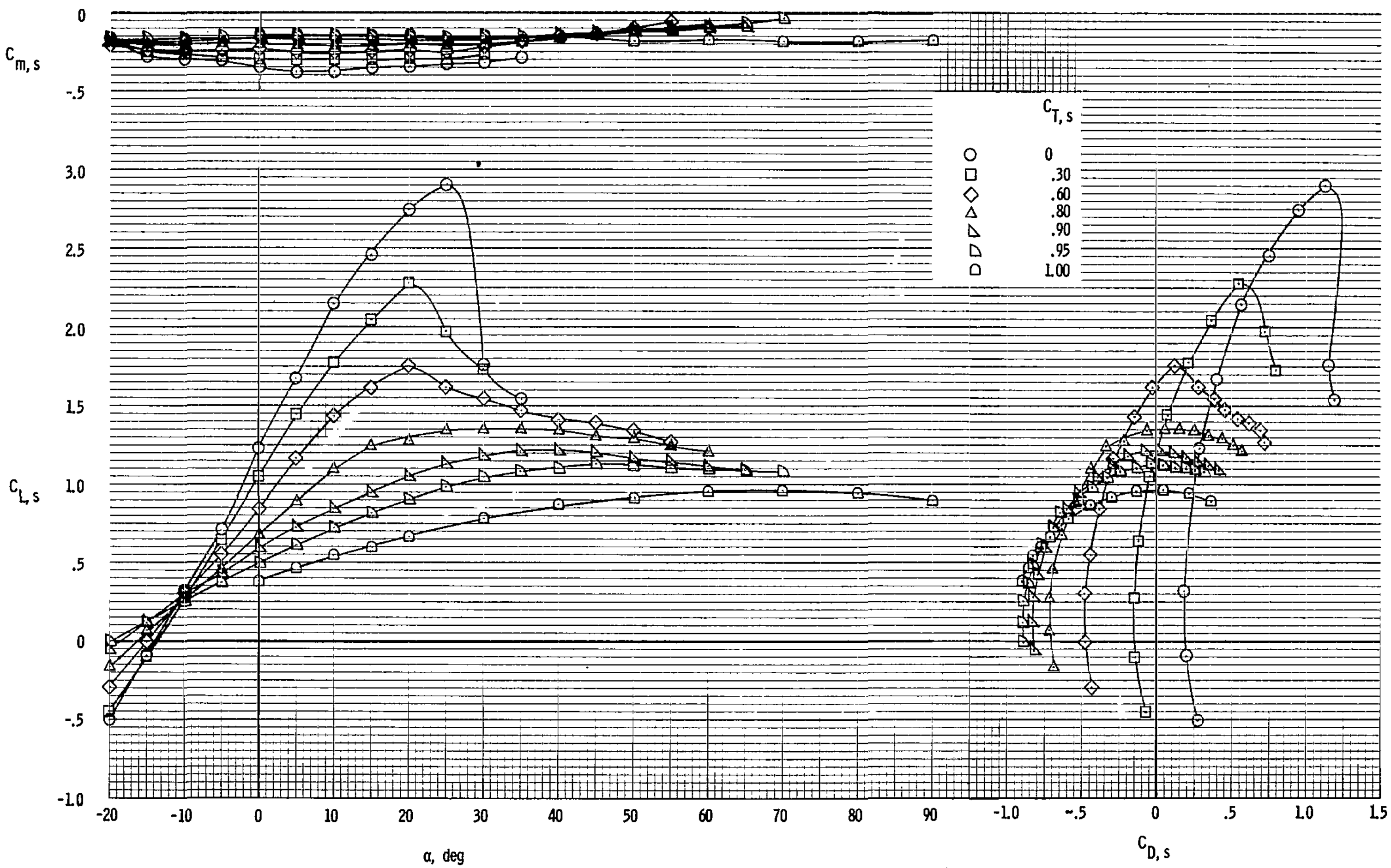
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7140

Figure 9.- Continued.



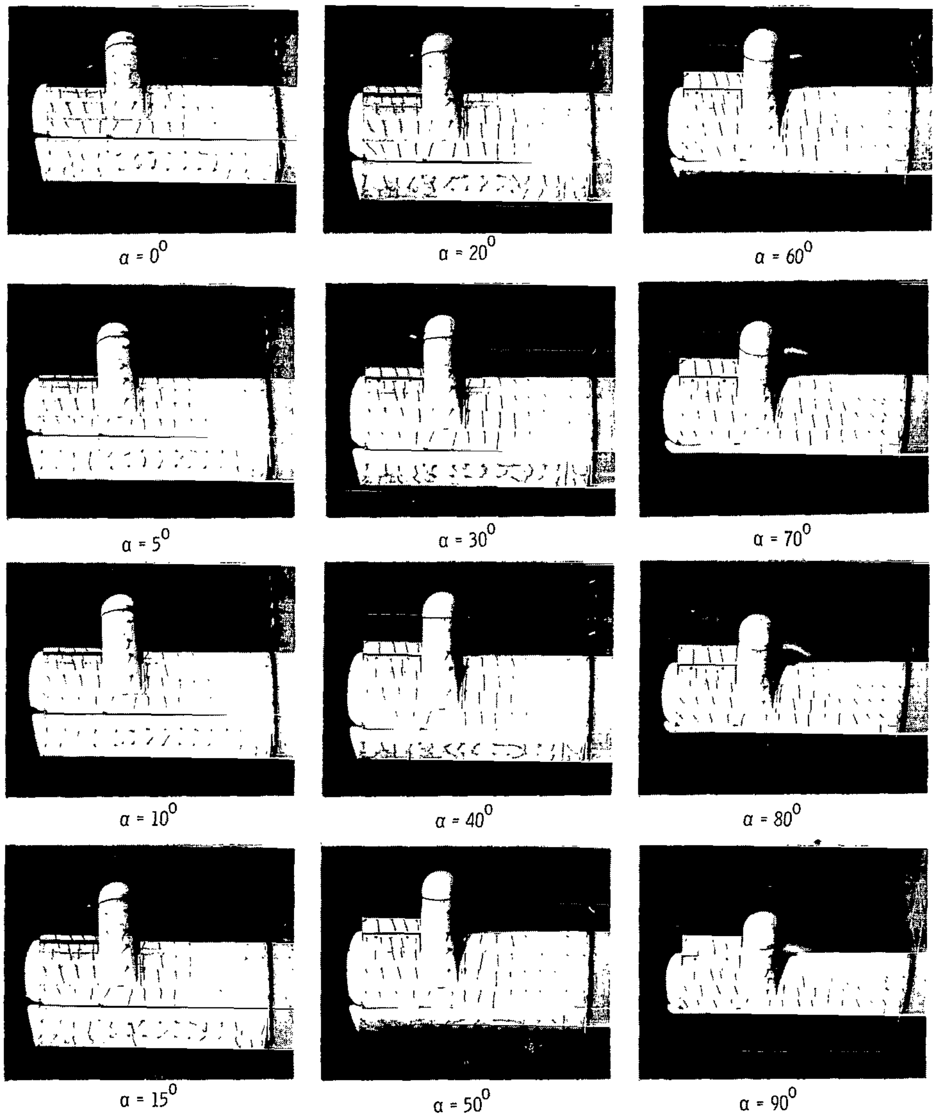
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7141

Figure 9.- Concluded.



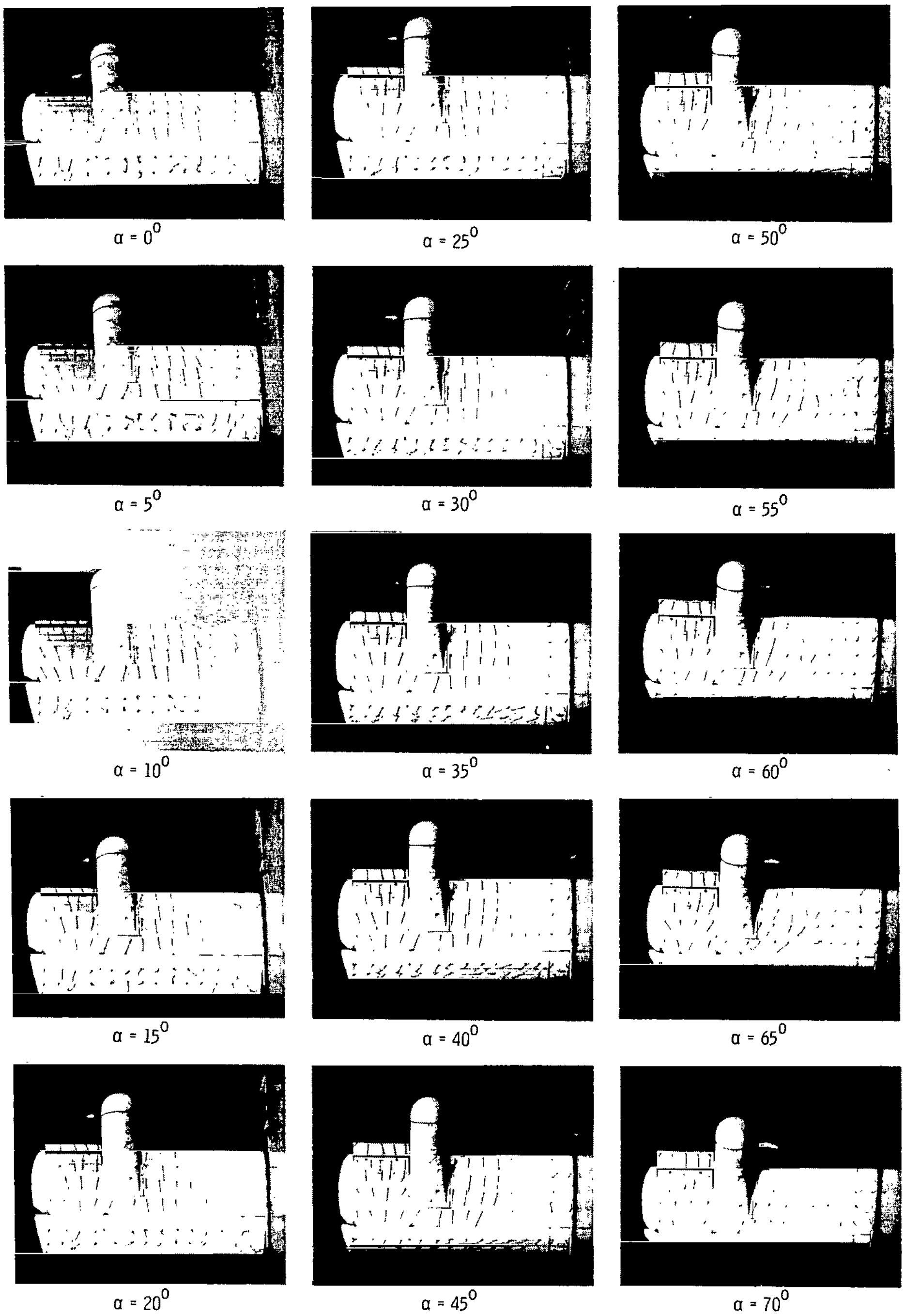
(a) Aerodynamic characteristics.

Figure 10.- Aerodynamic and flow characteristics of the model with the outboard section of the slat deflected 20° and with the trailing-edge flap deflected 40°.



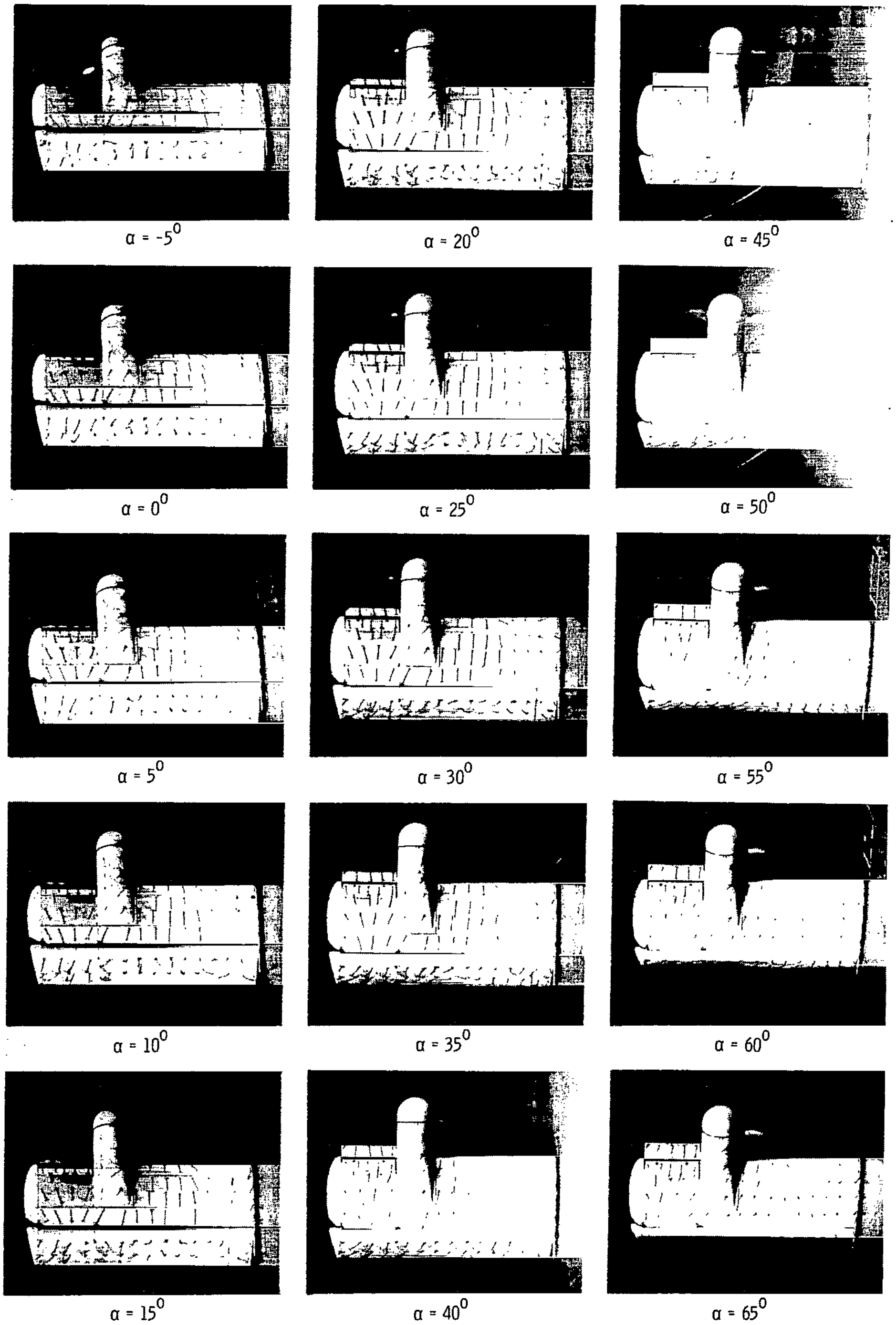
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7142

Figure 10.- Continued.



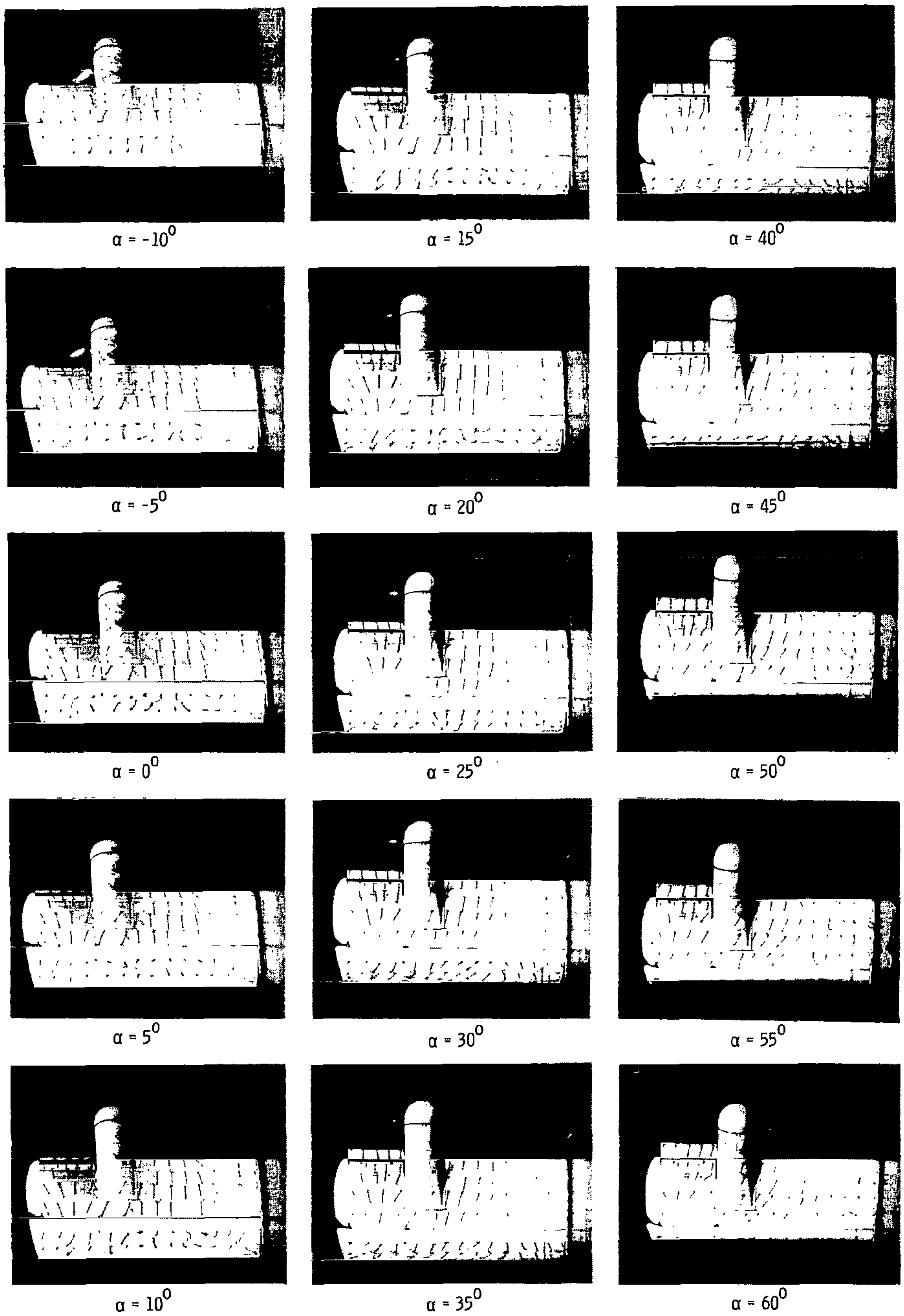
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7143

Figure 10.- Continued.



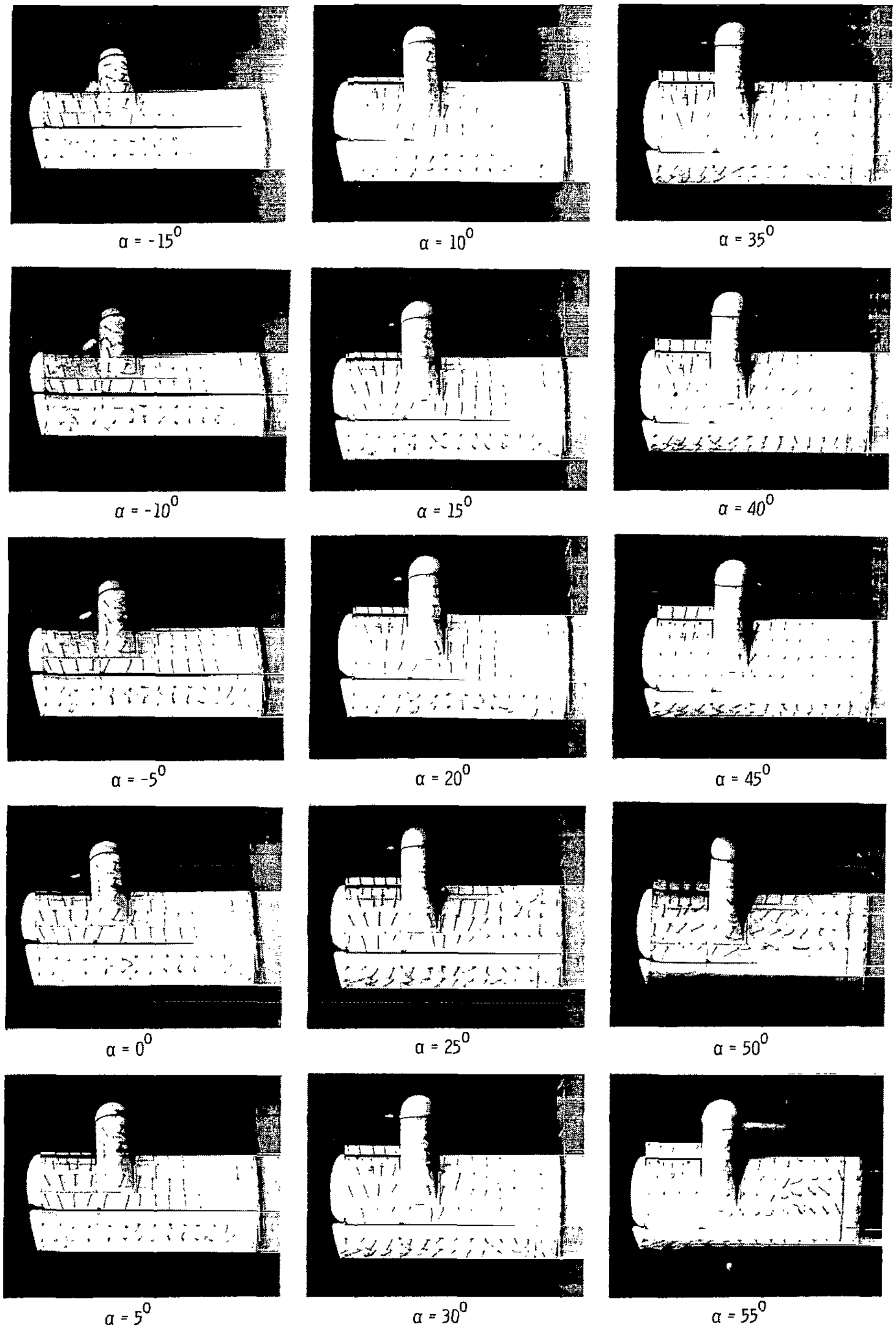
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7144

Figure 10.- Continued.



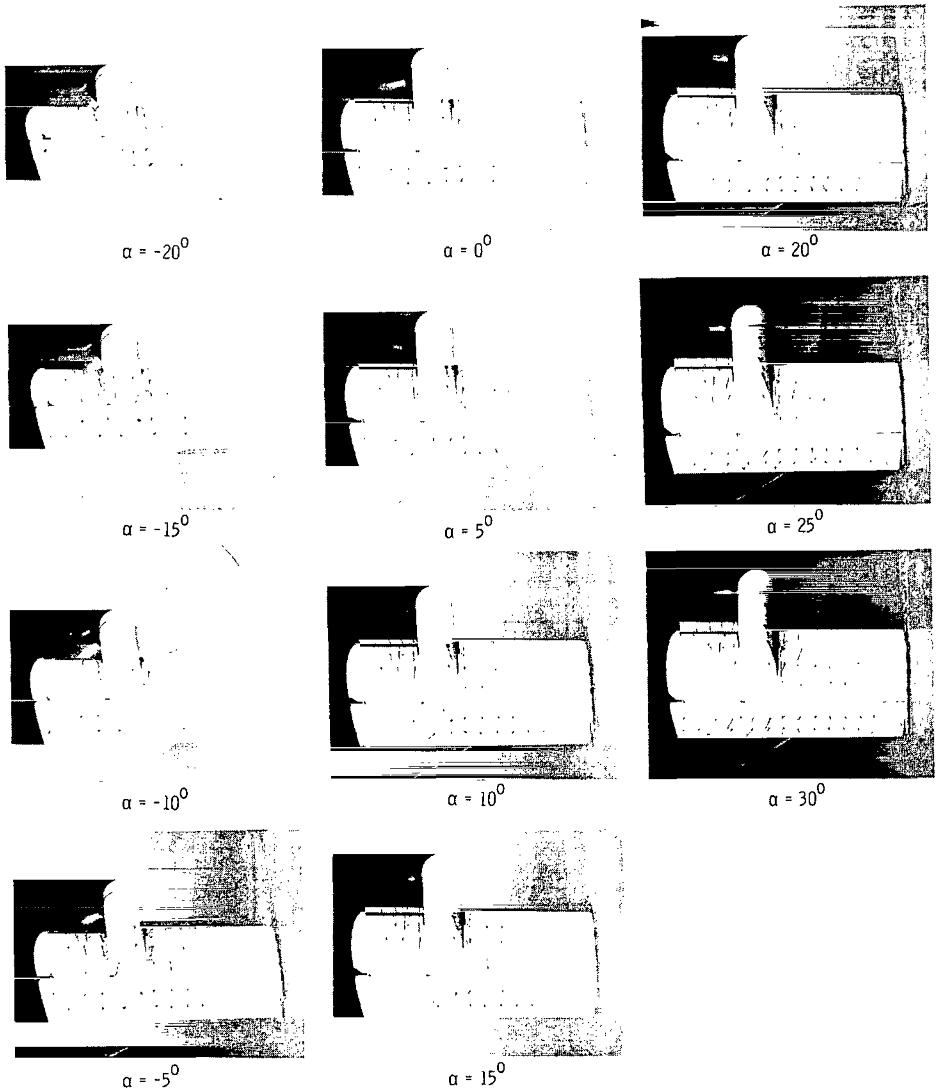
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7145

Figure 10.- Continued.



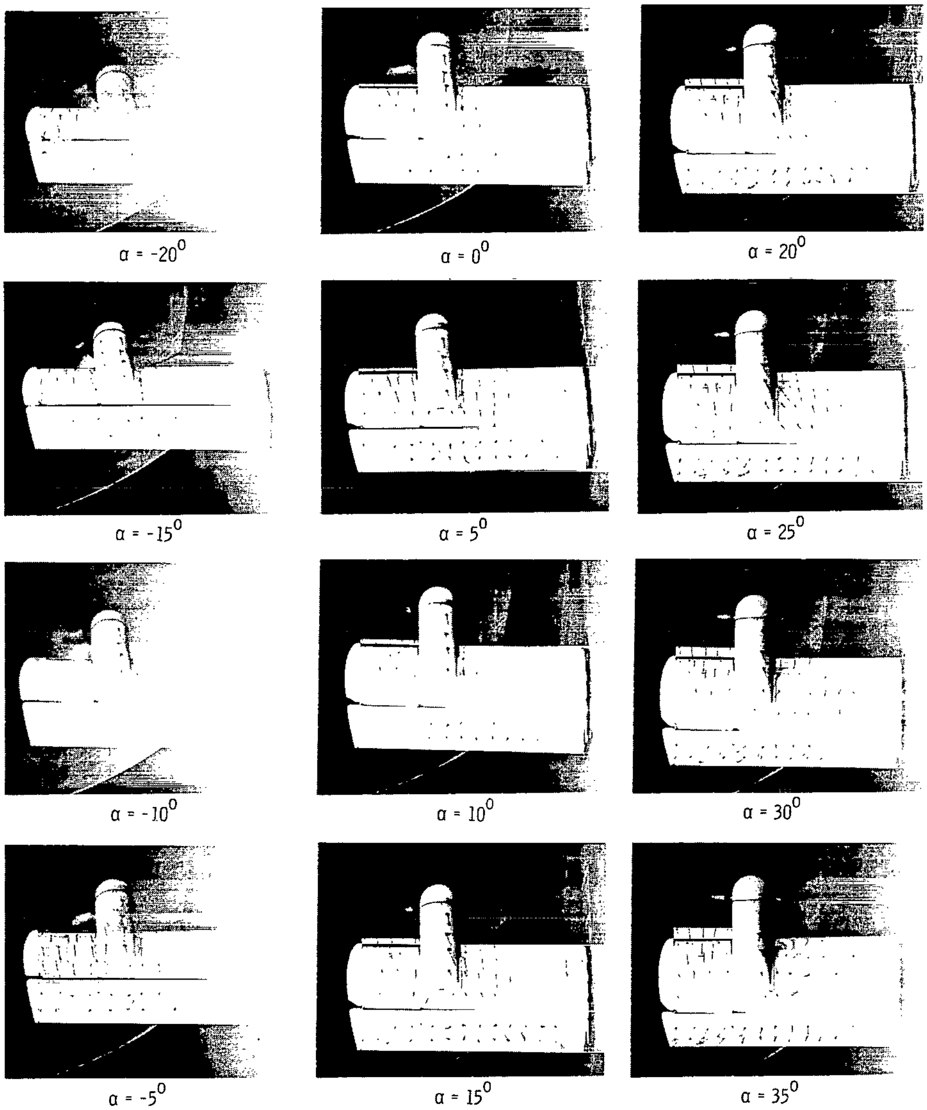
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7146

Figure 10.- Continued.



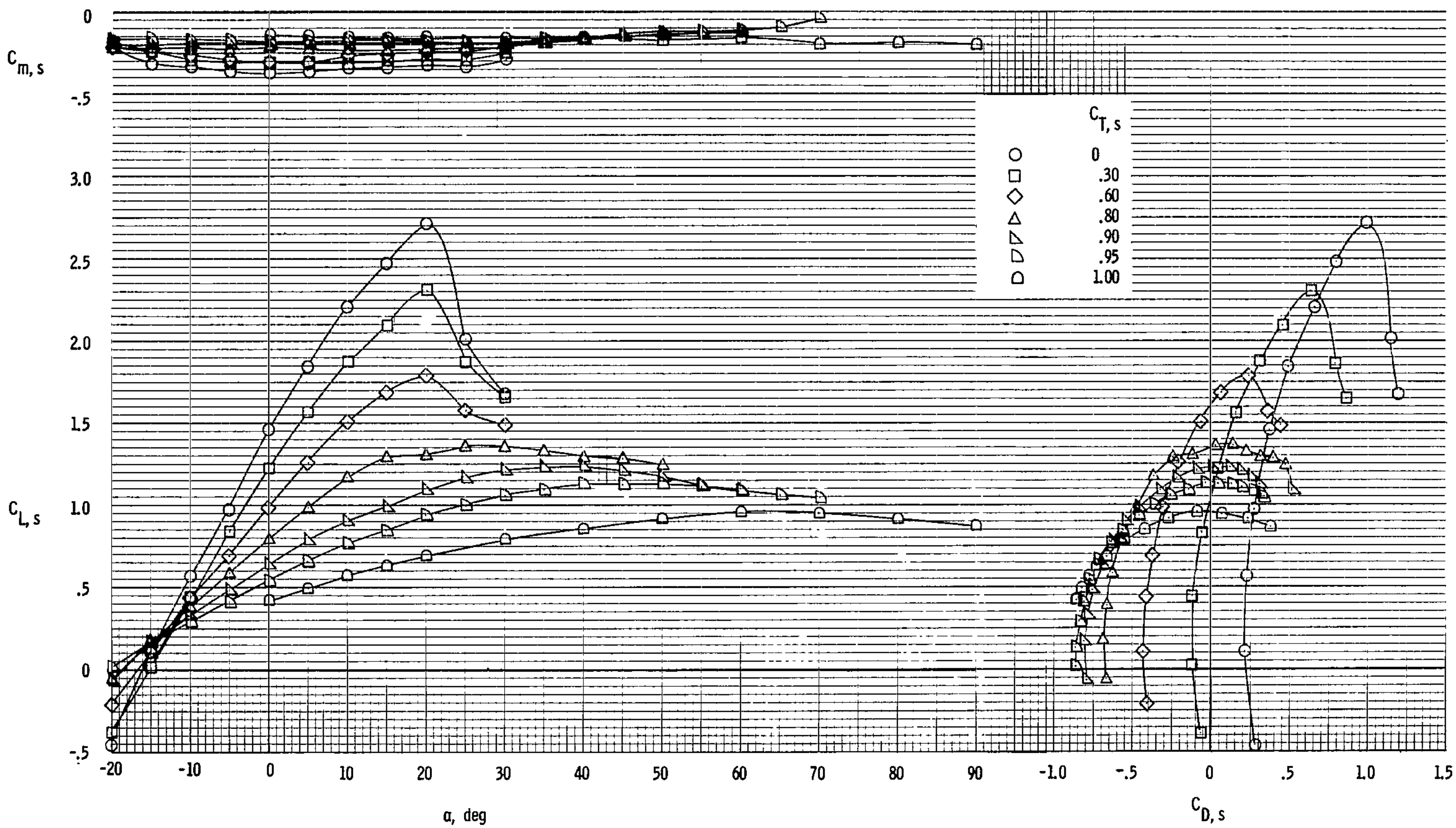
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7147

Figure 10.- Continued.



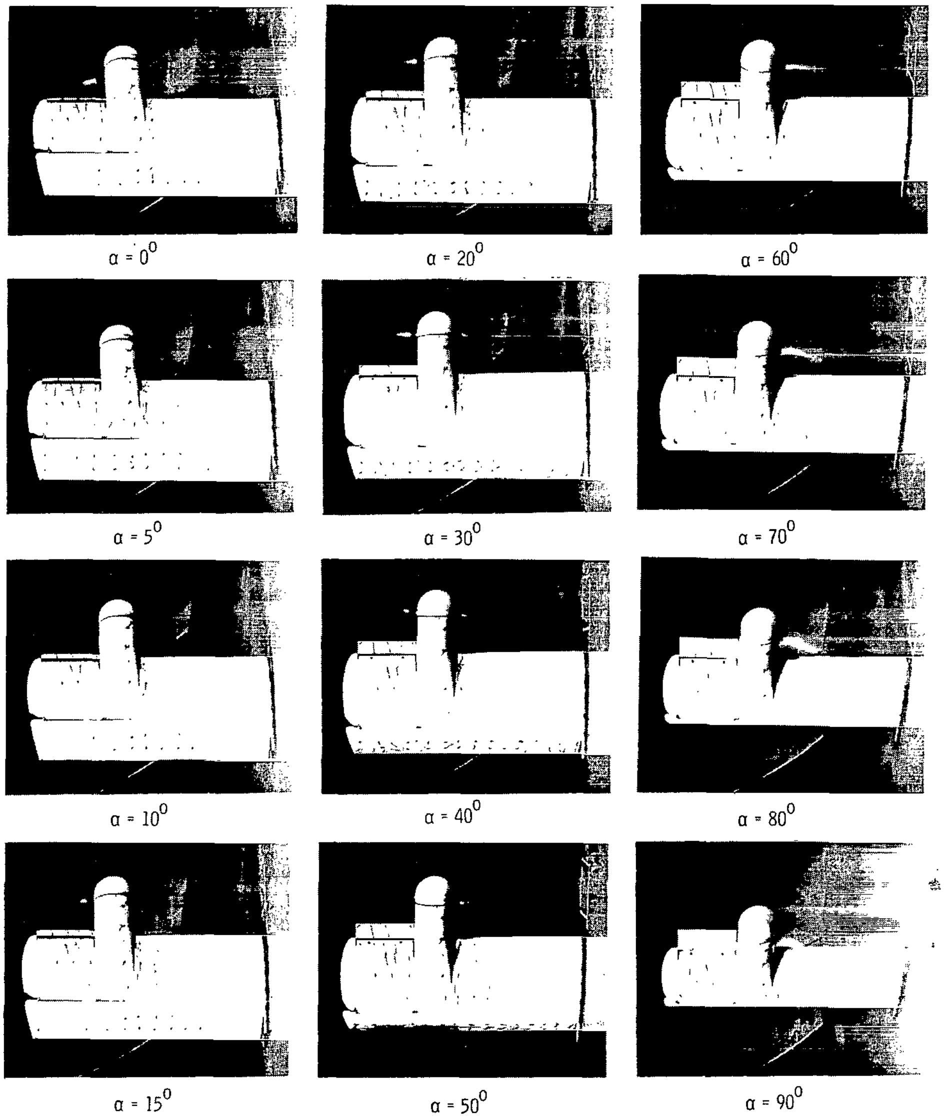
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7148

Figure 10.- Concluded.



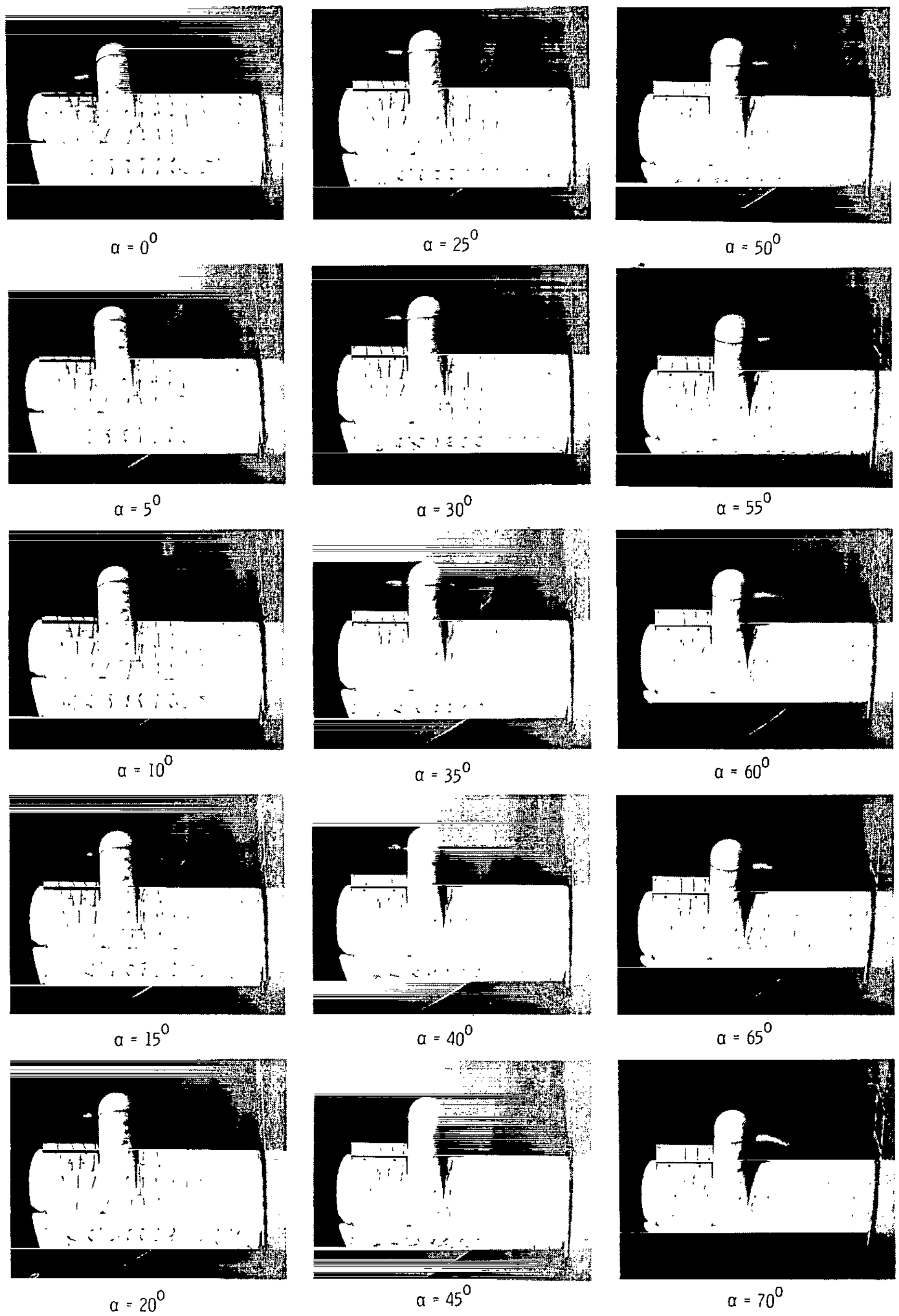
(a) Aerodynamic characteristics.

Figure 11.- Aerodynamic and flow characteristics of the model with the outboard section of the slat deflected 20° and with the trailing-edge flap deflected 50°.



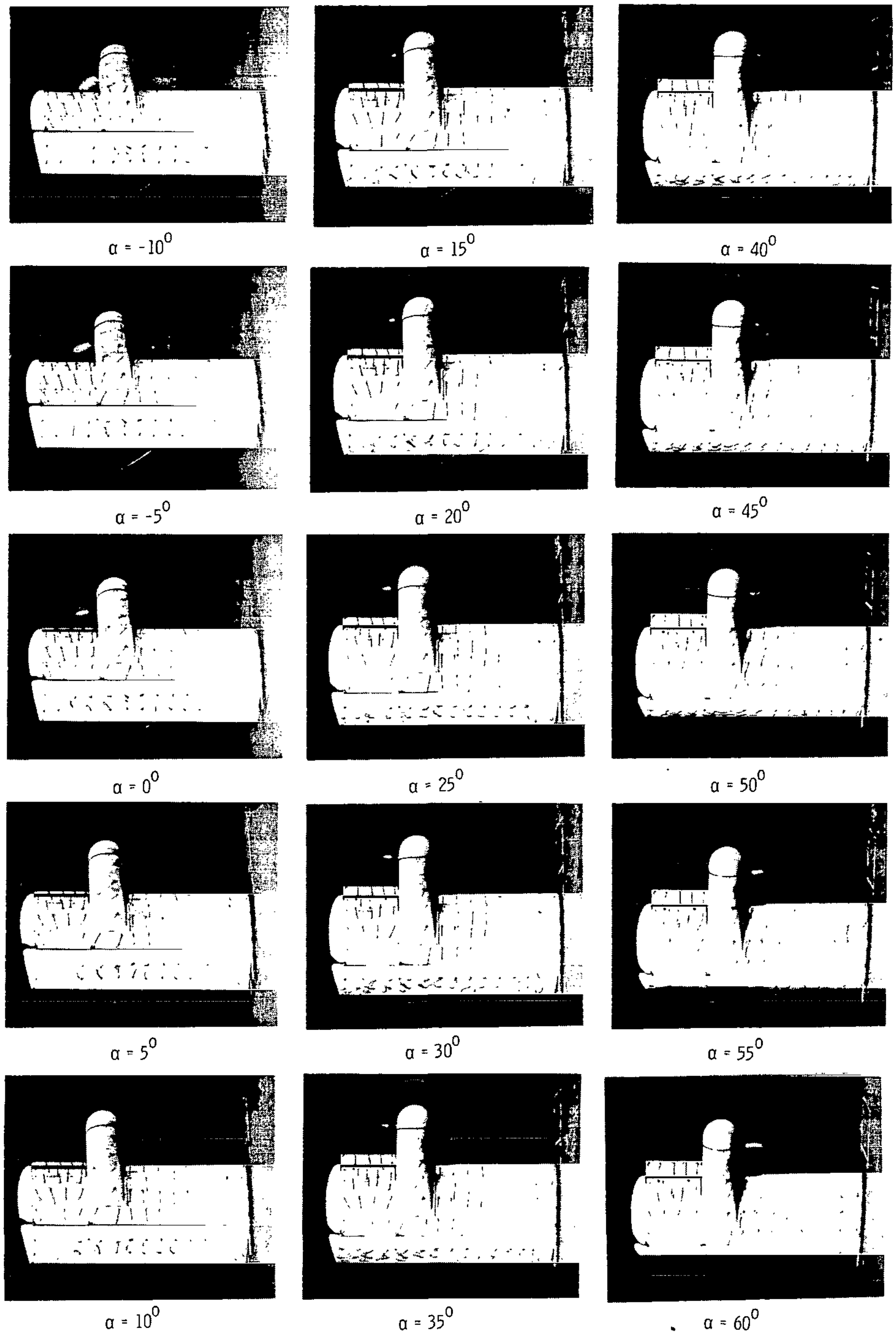
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7149

Figure 11.- Continued.



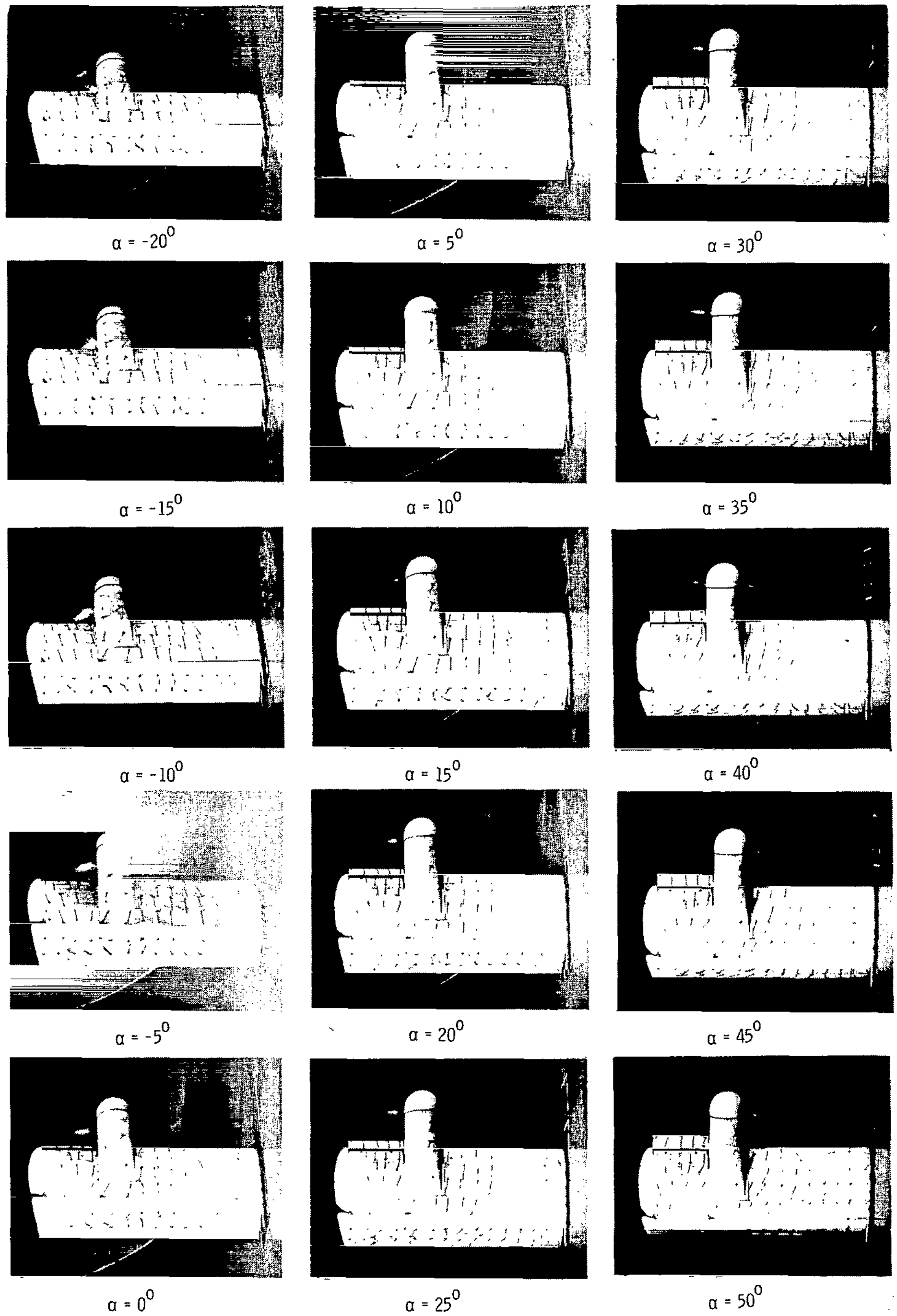
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7150

Figure 11.- Continued.



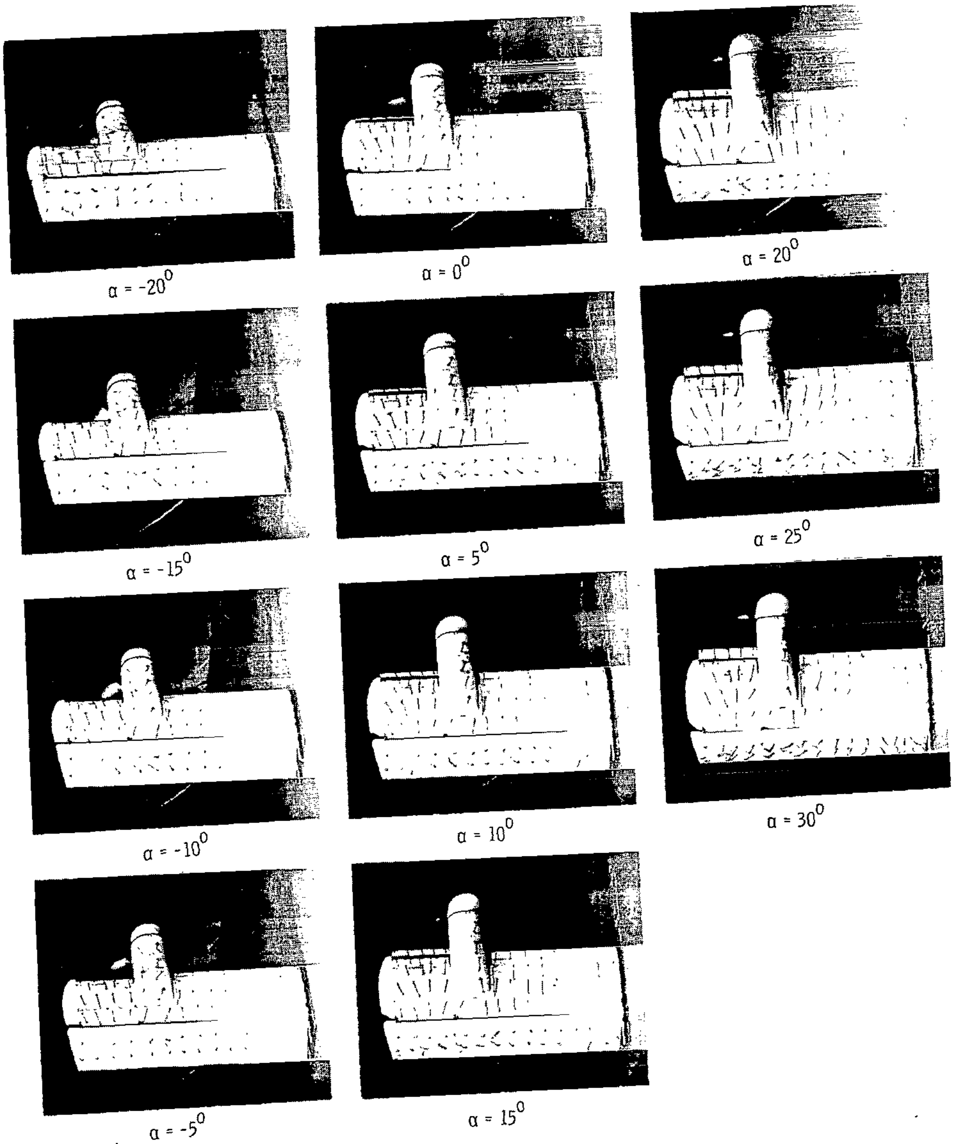
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7151

Figure 11.- Continued.



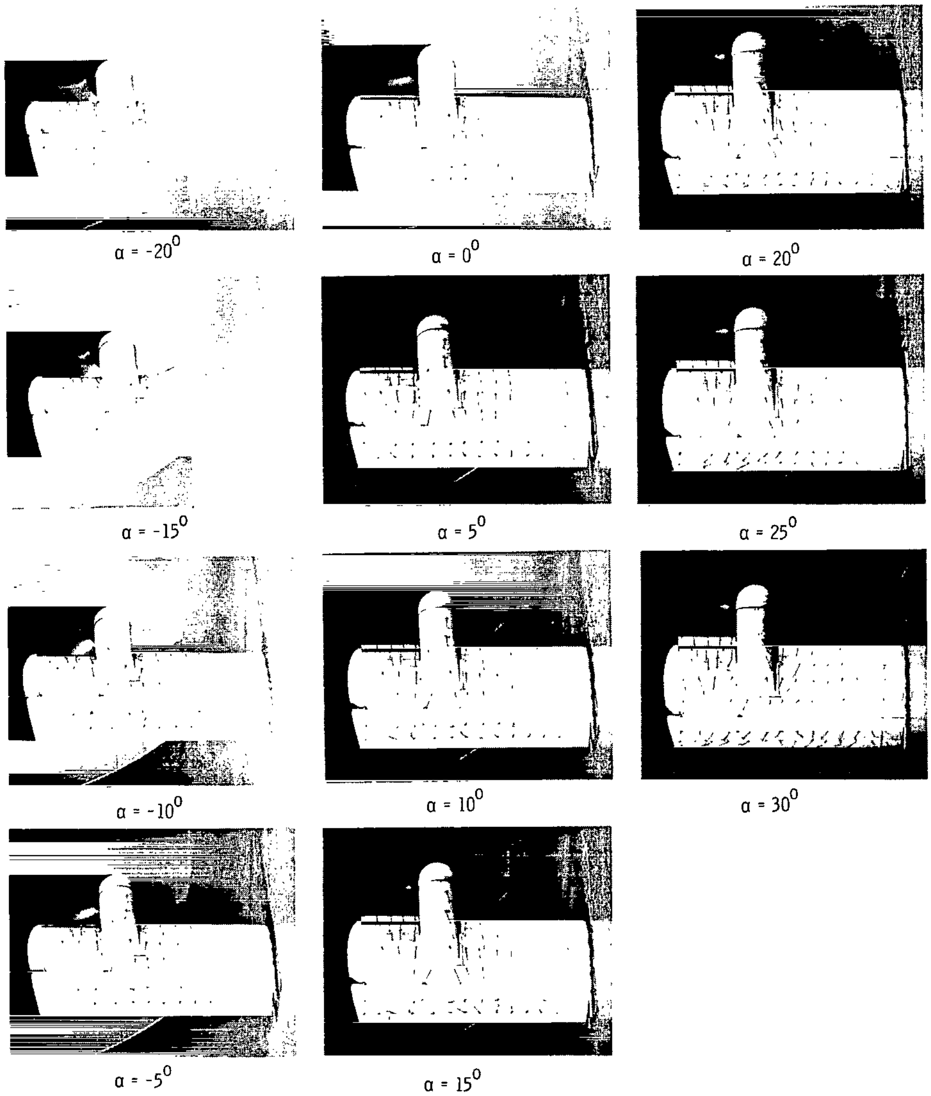
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7152

Figure 11.- Continued.



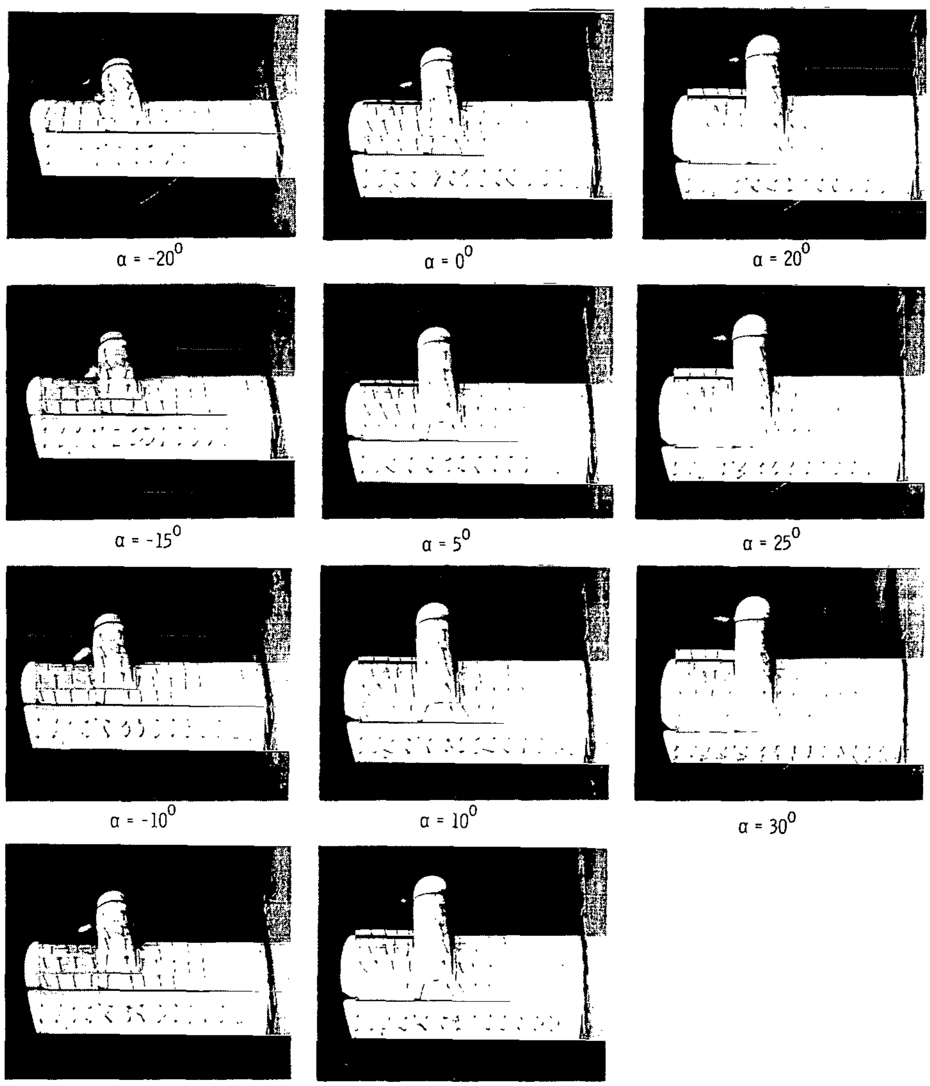
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7153

Figure 11.- Continued.



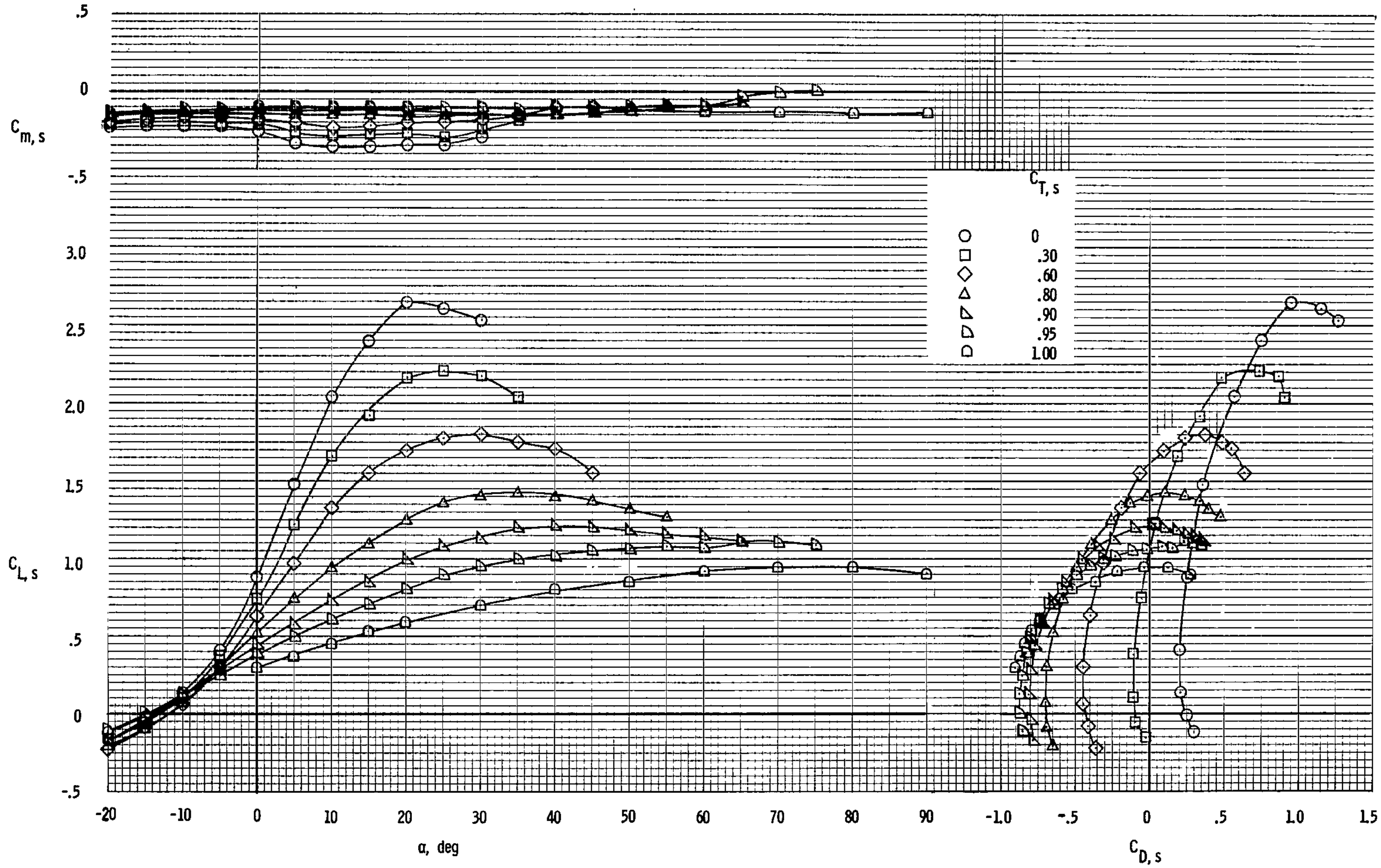
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7154

Figure 11.- Continued.



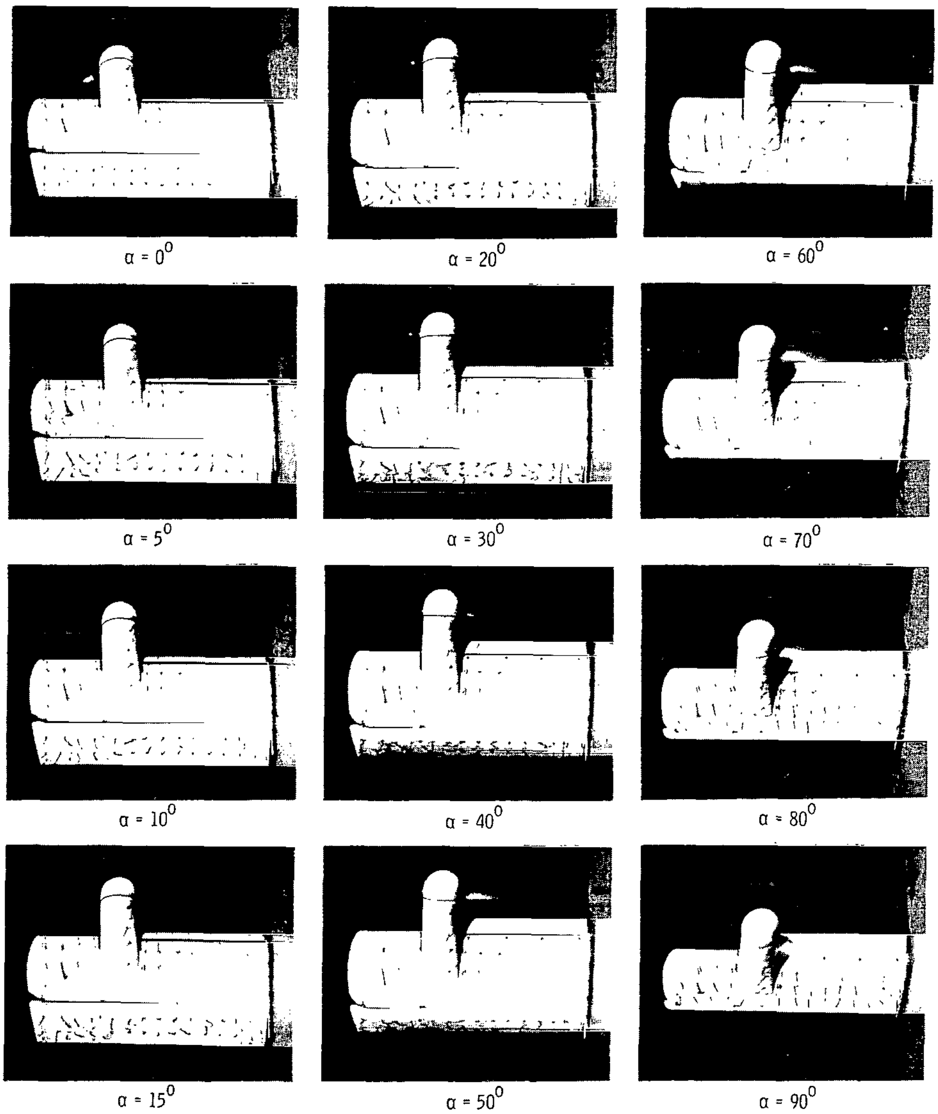
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7155

Figure 11.- Concluded.



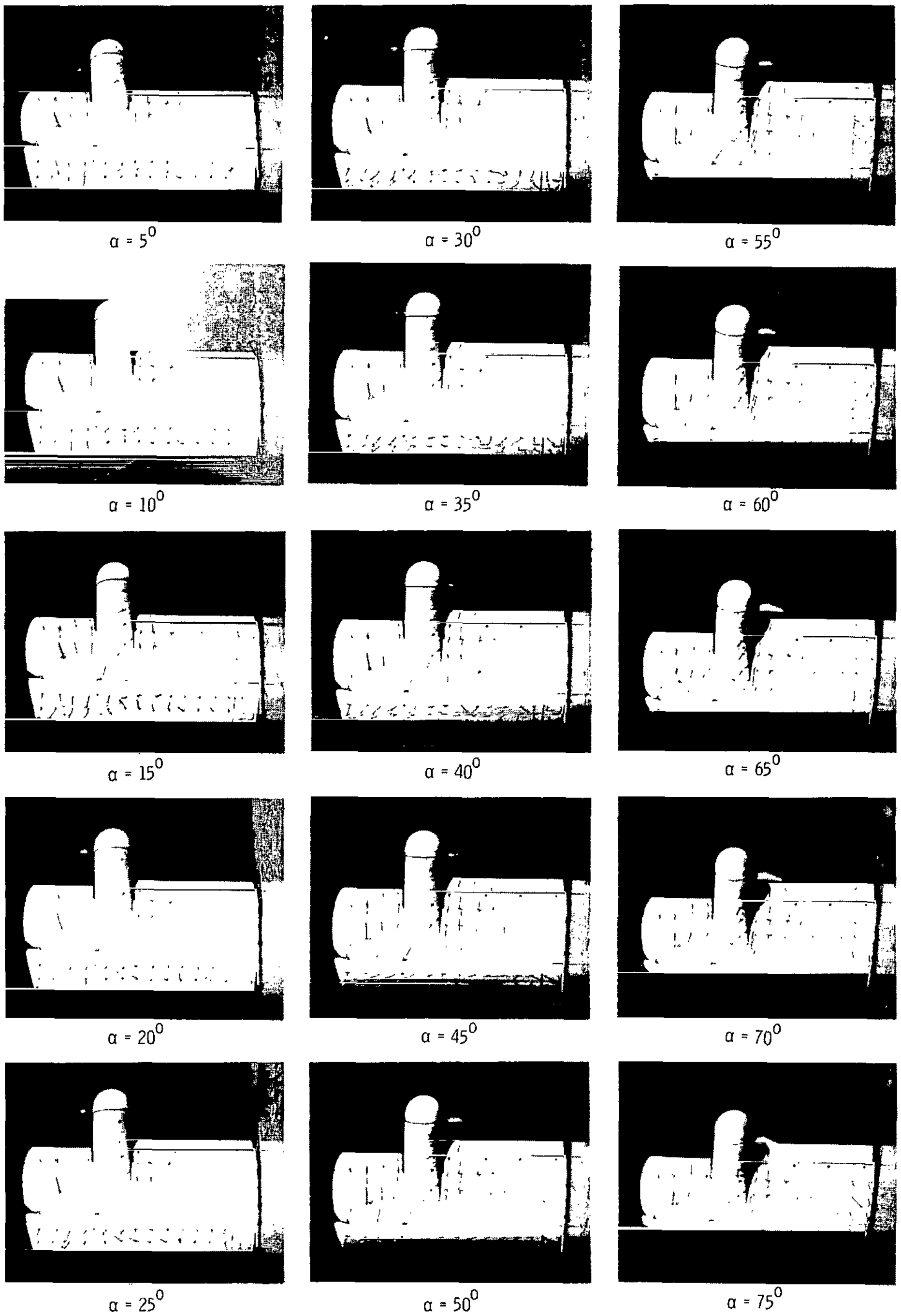
(a) Aerodynamic characteristics.

Figure 12.- Aerodynamic and flow characteristics of the model with the inboard section of the slat deflected 20° and with the trailing-edge flap deflected 40°.



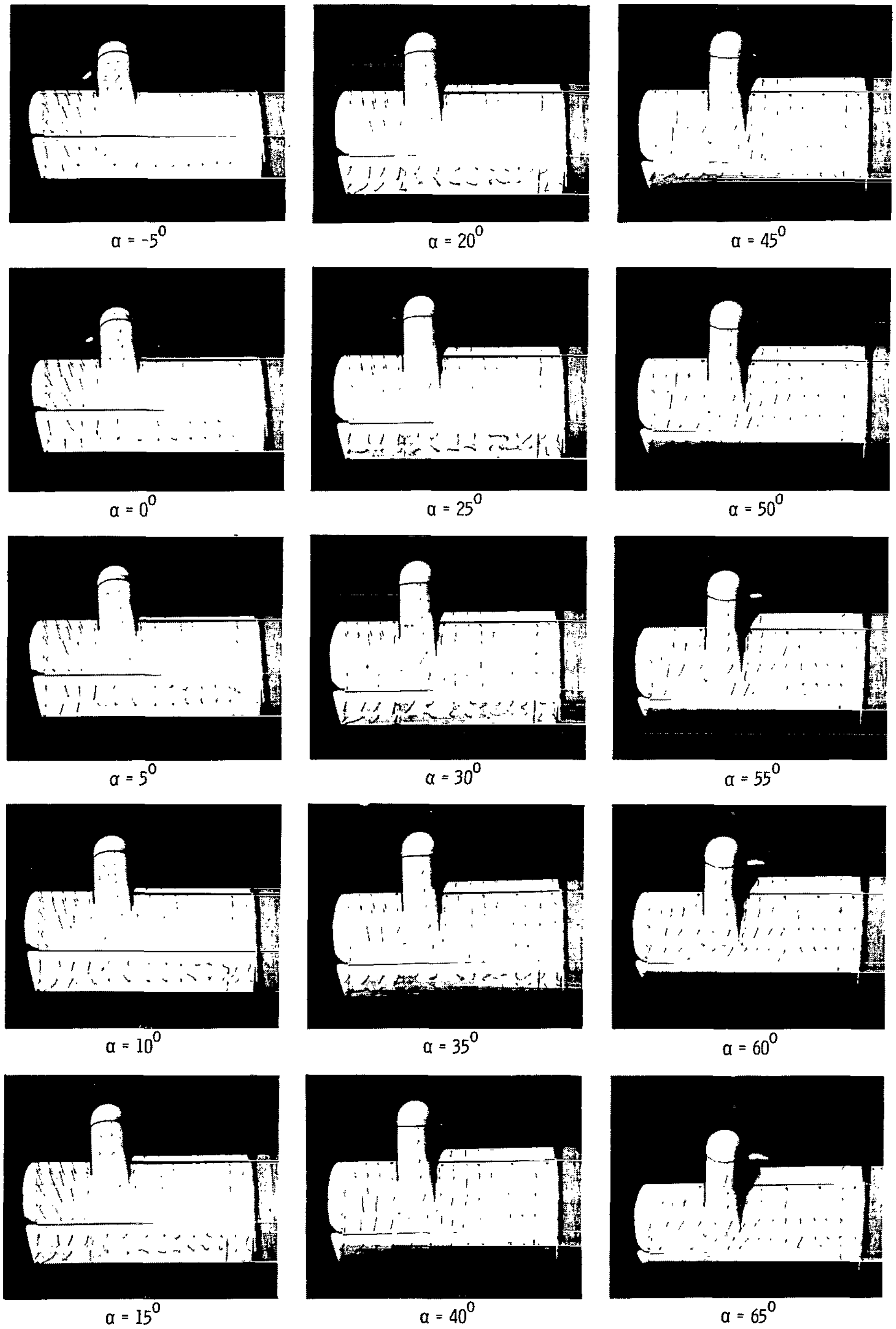
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7156

Figure 12.- Continued.



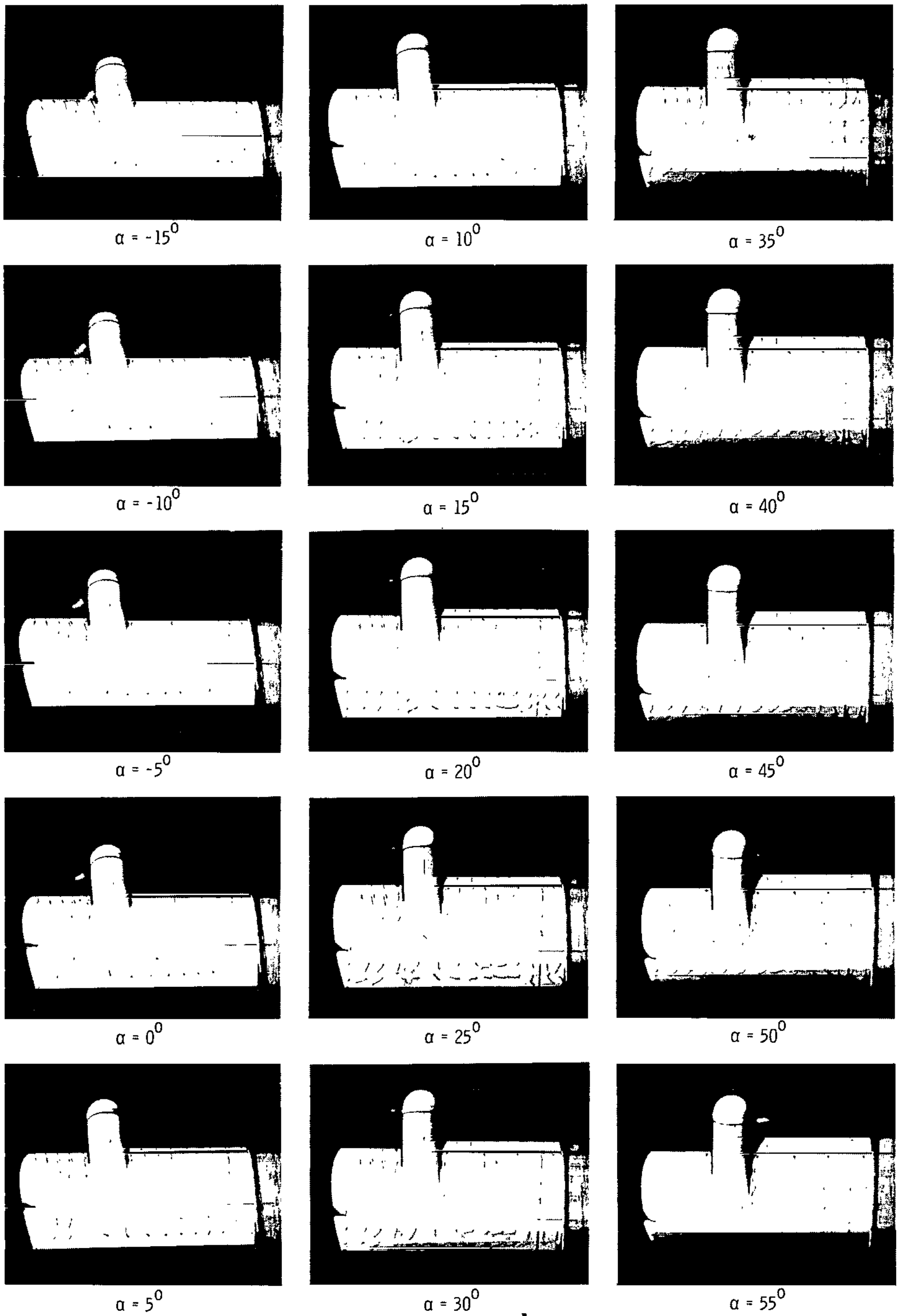
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7157

Figure 12.- Continued.



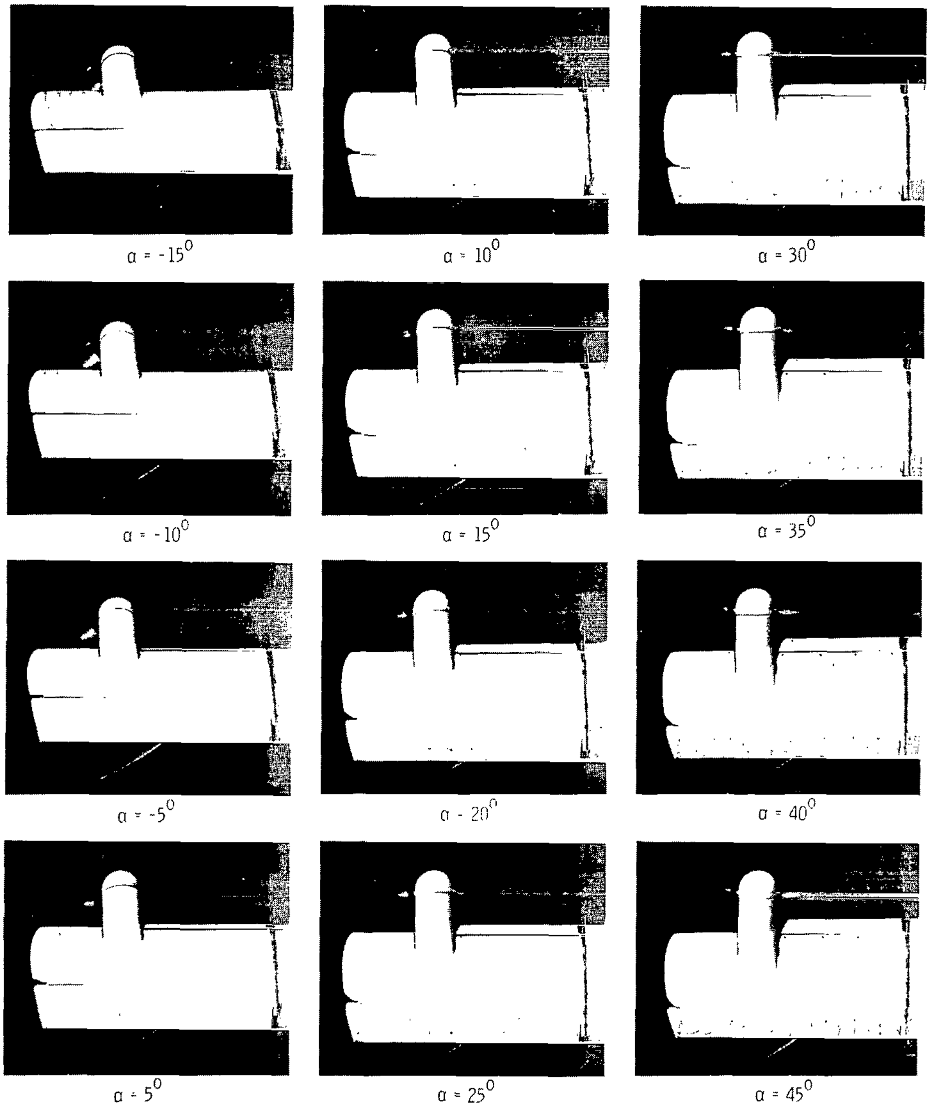
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7158

Figure 12.- Continued.



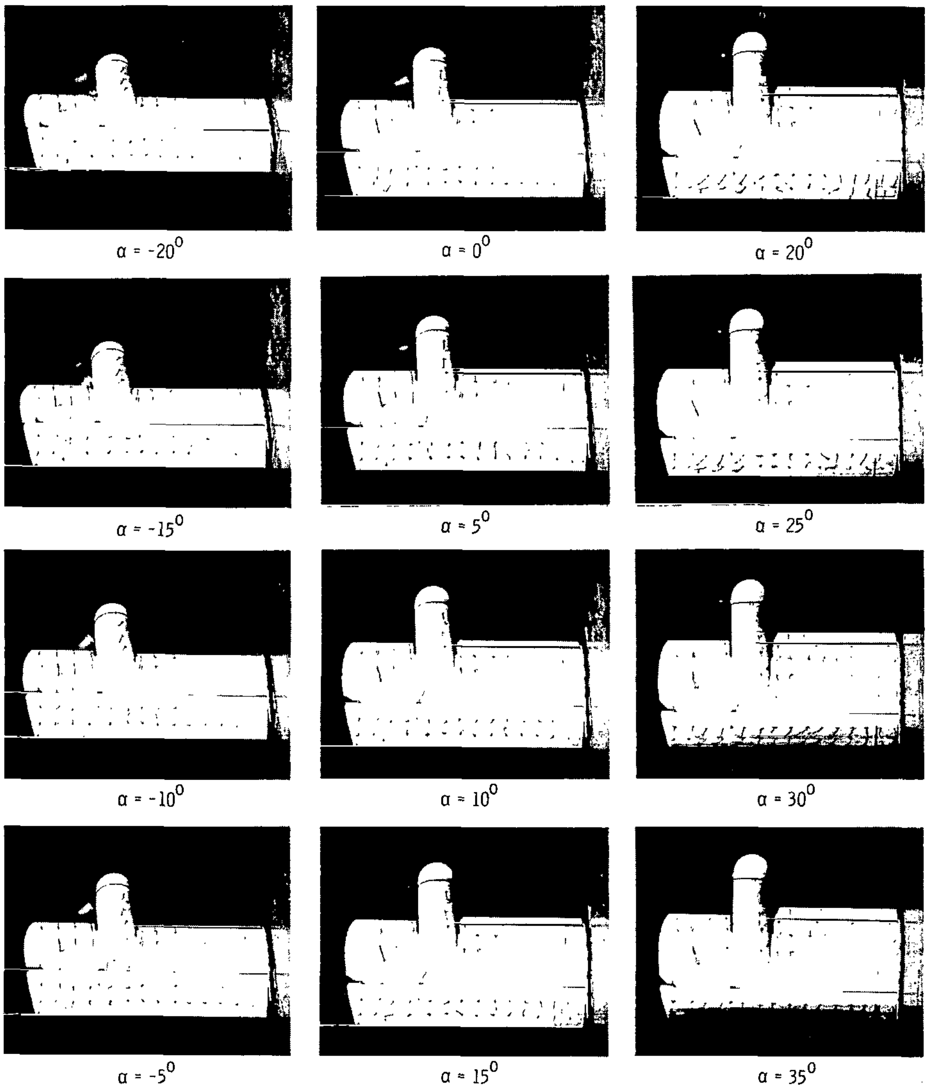
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7159

Figure 12.- Continued.



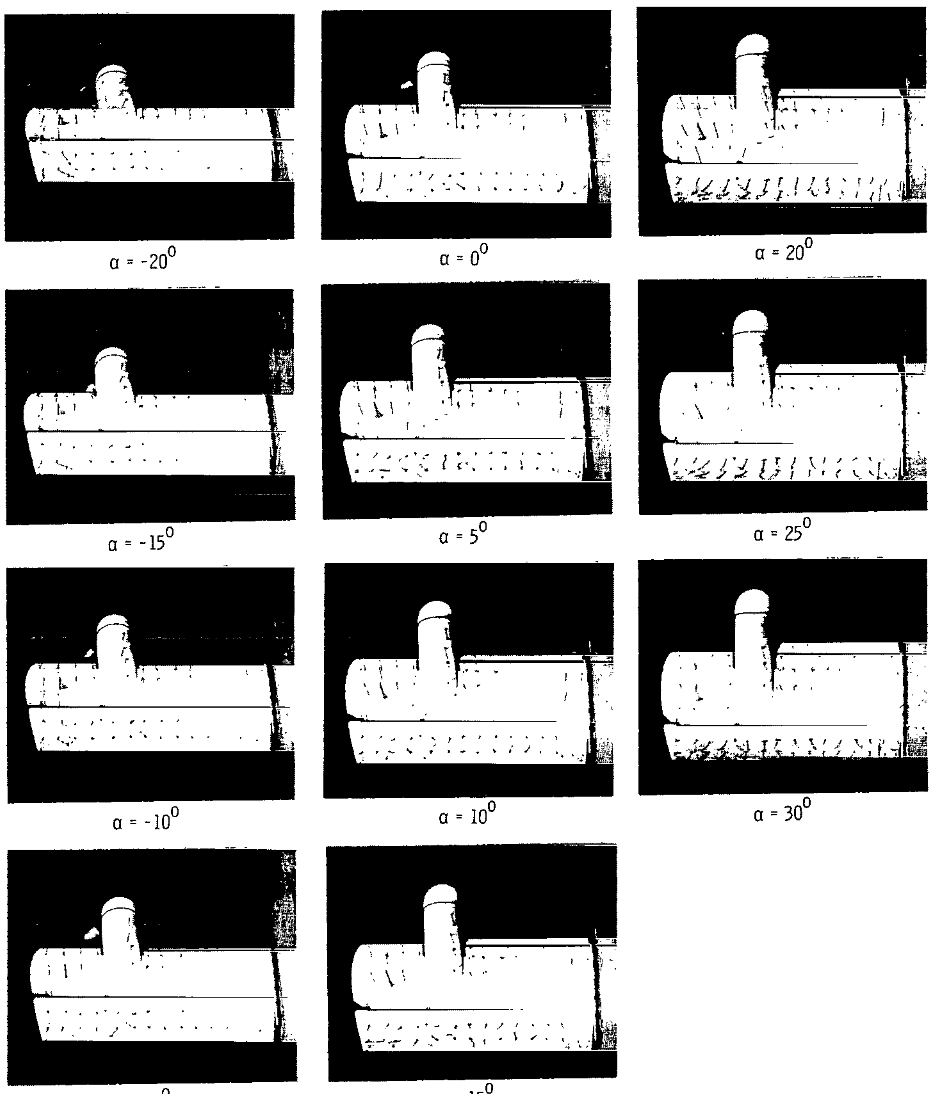
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7160

Figure 12.- Continued.



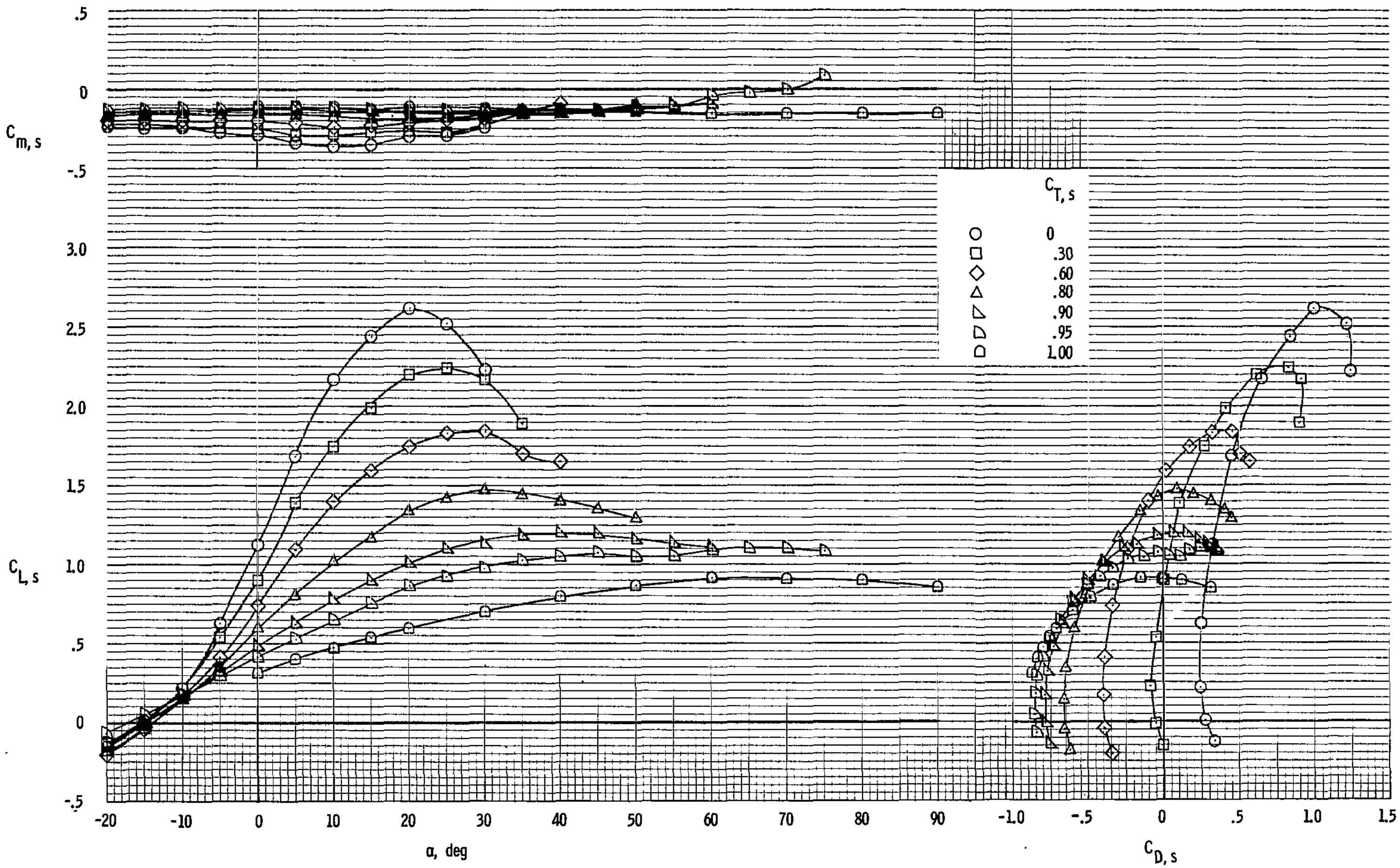
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7161

Figure 12.- Continued.



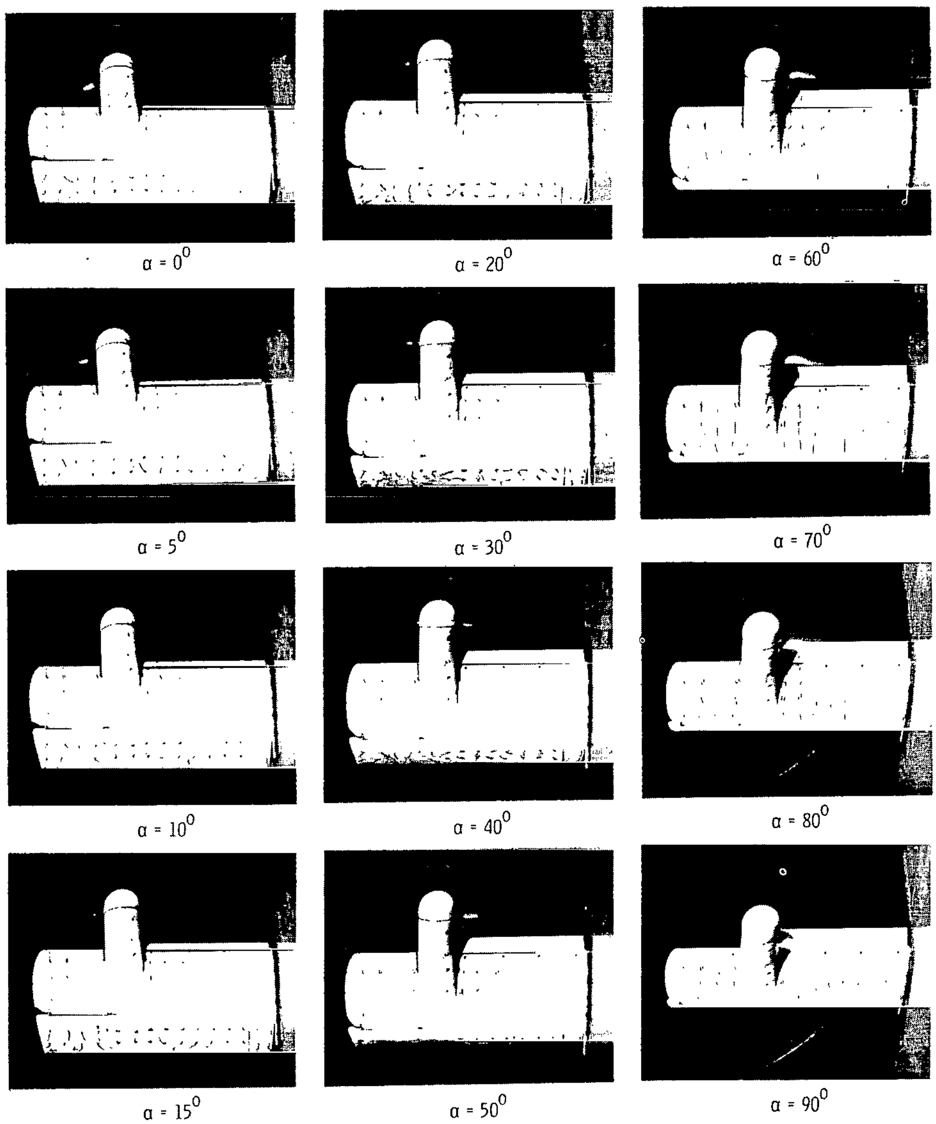
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7162

Figure 12.- Concluded.



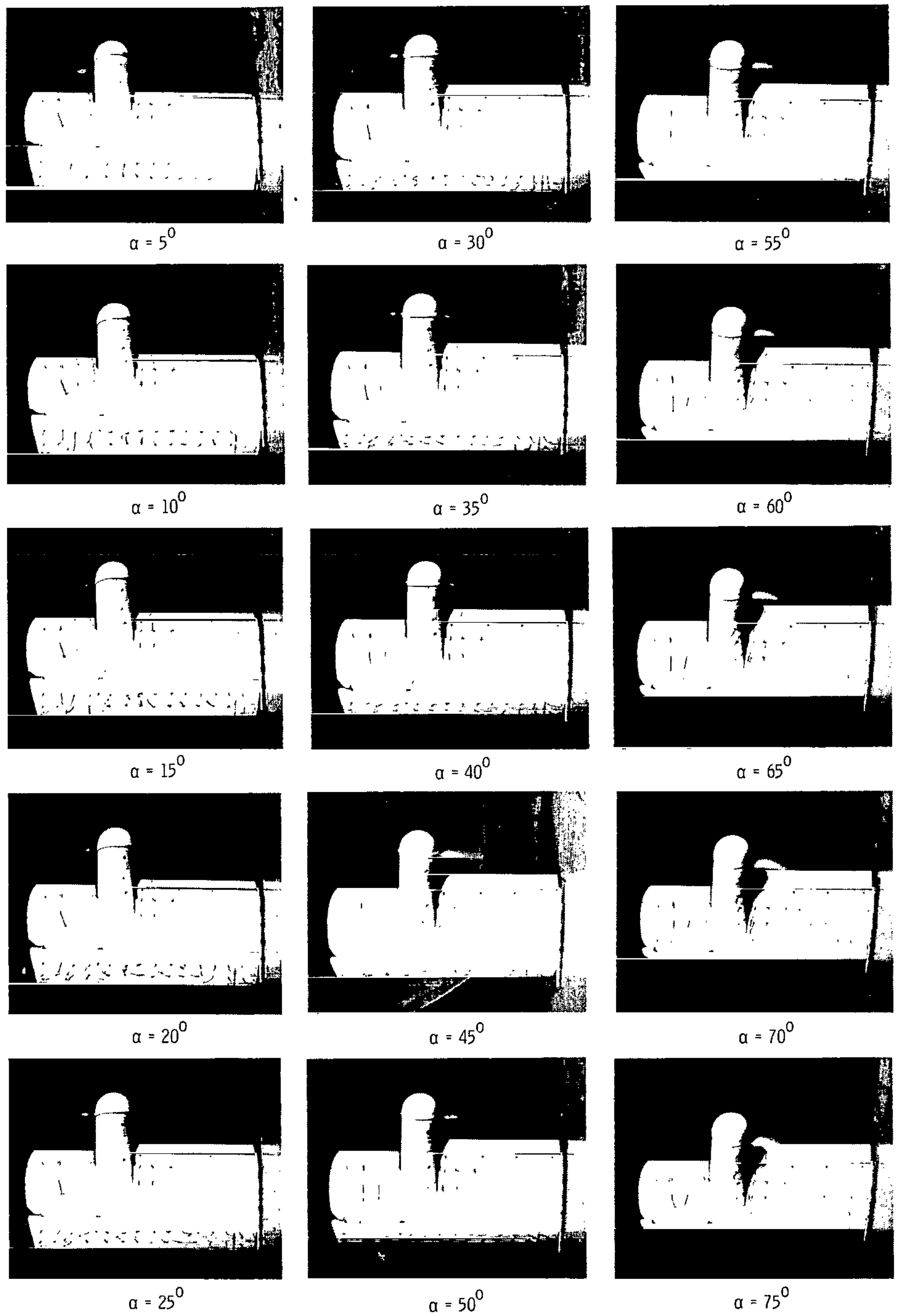
(a) Aerodynamic characteristics.

Figure 13.- Aerodynamic and flow characteristics of the model with the inboard section of the slat deflected 20° and with the trailing-edge flap deflected 50°.



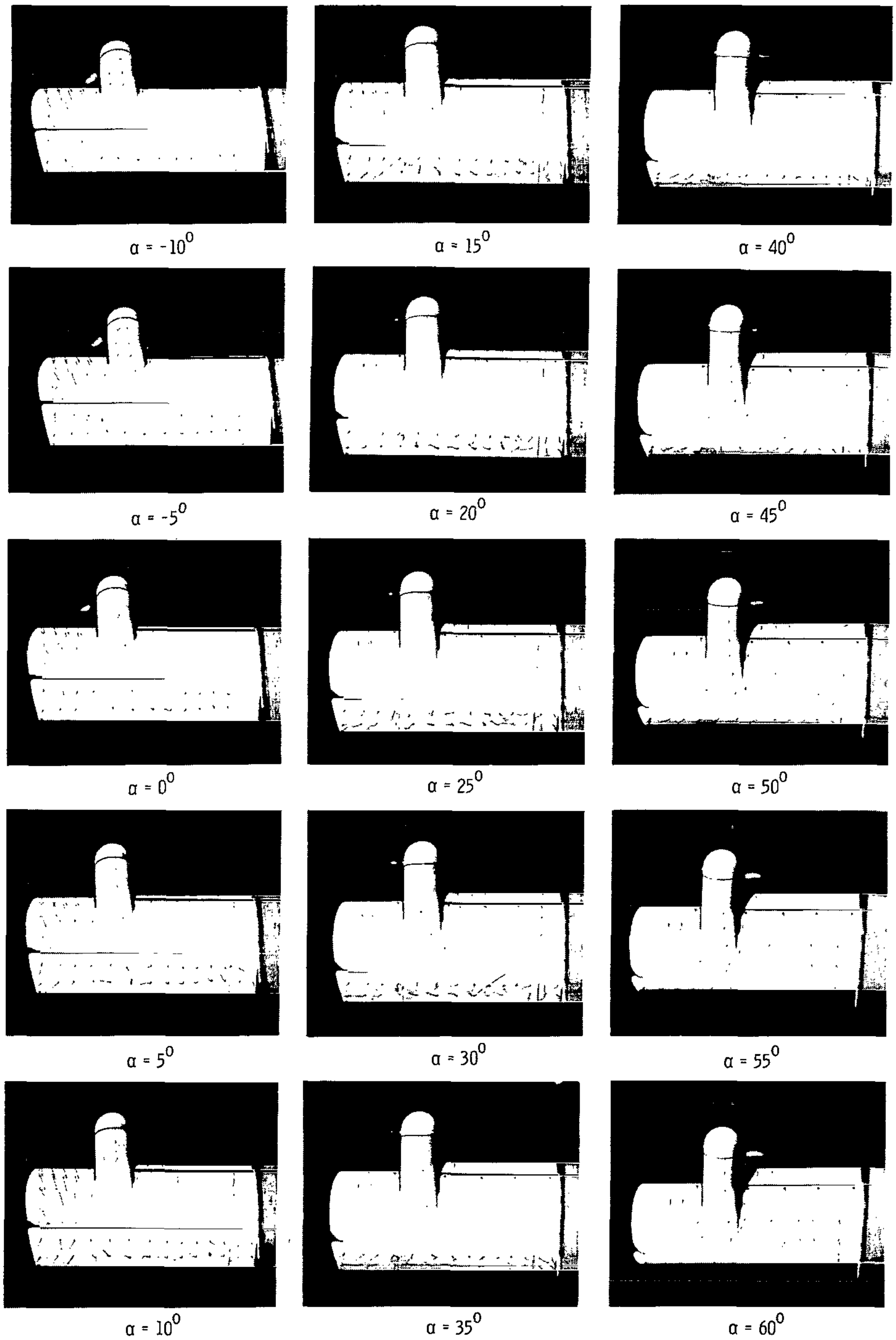
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7163

Figure 13.- Continued.



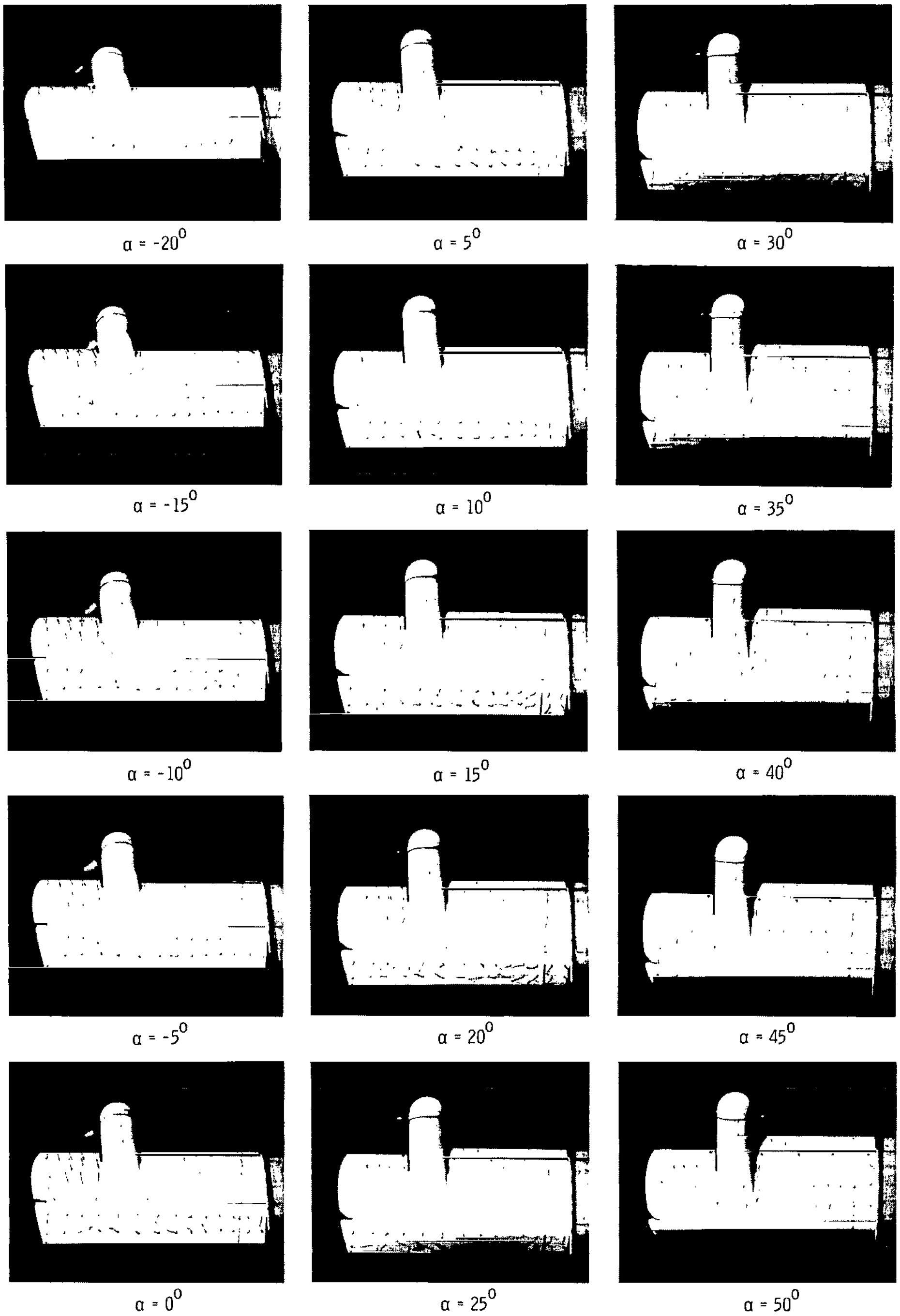
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7164

Figure 13.- Continued.



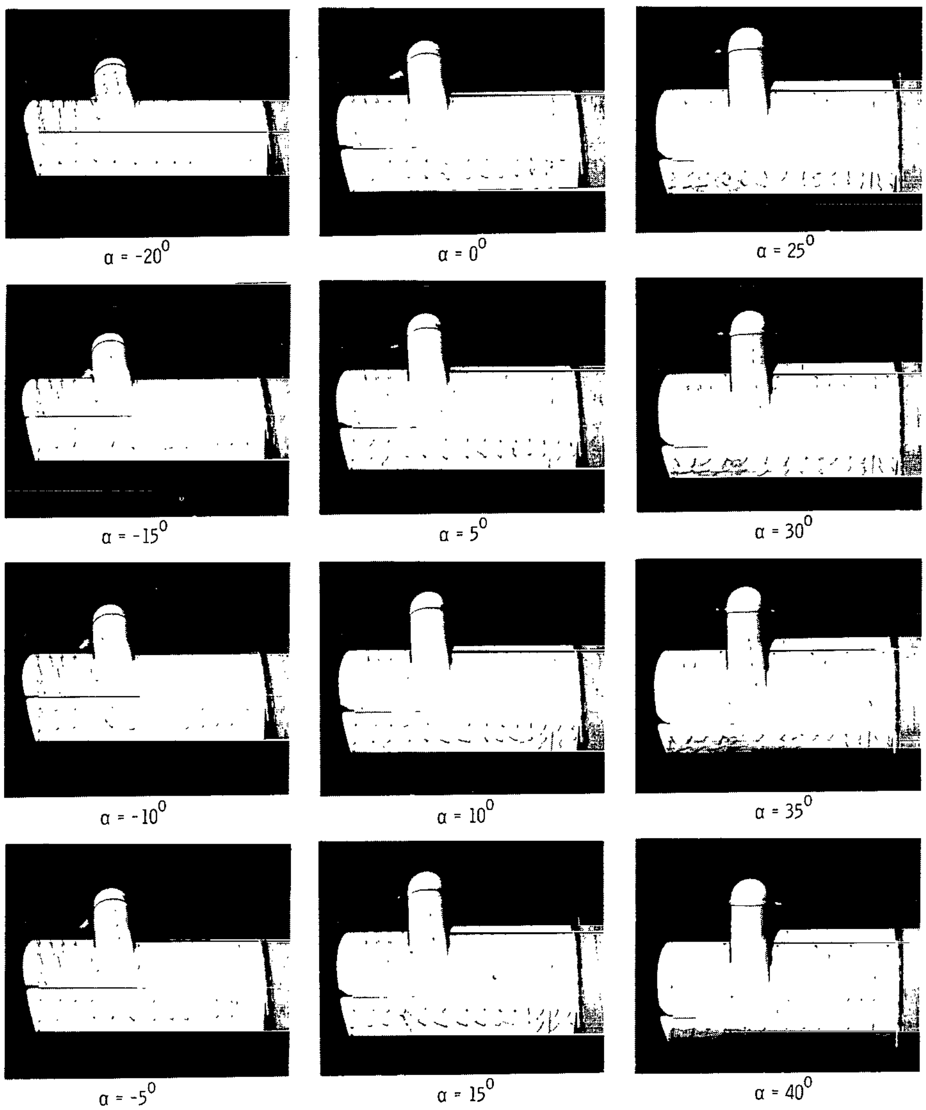
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7165

Figure 13.- Continued.



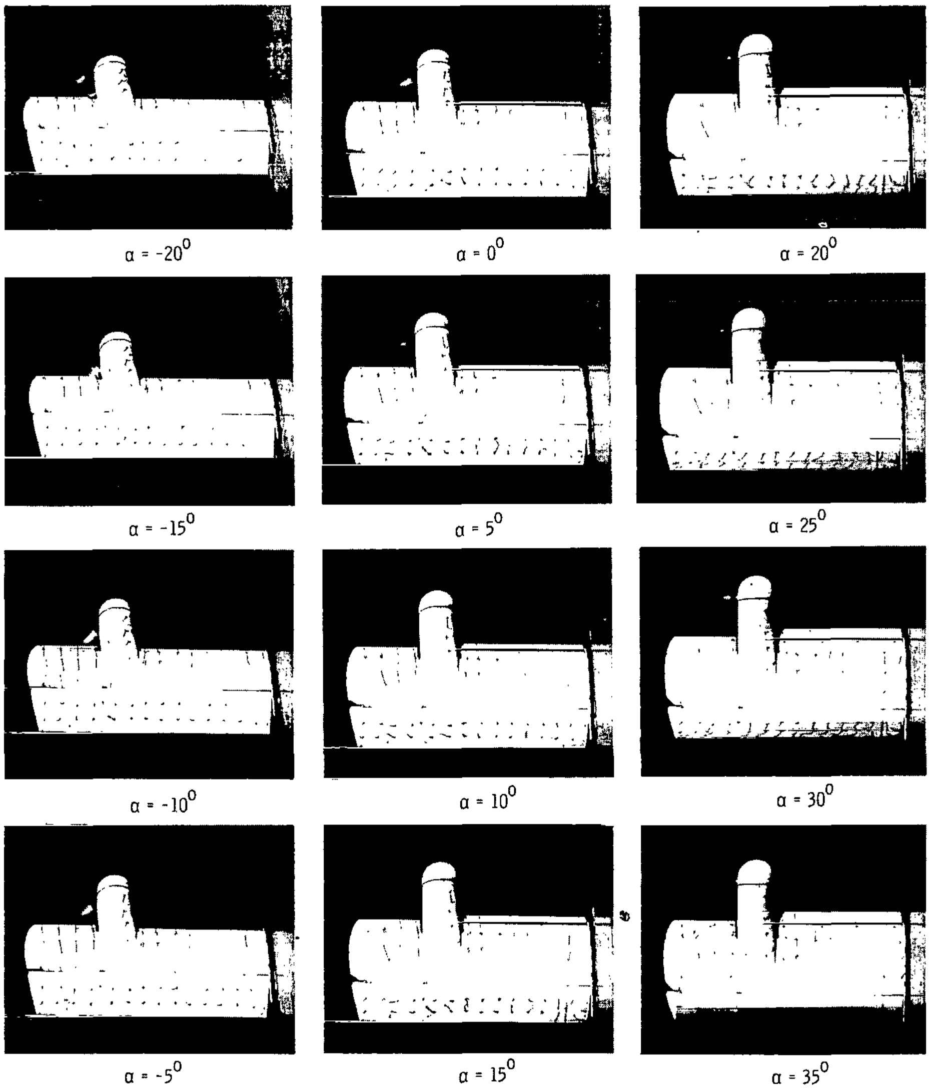
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7166

Figure 13.- Continued.



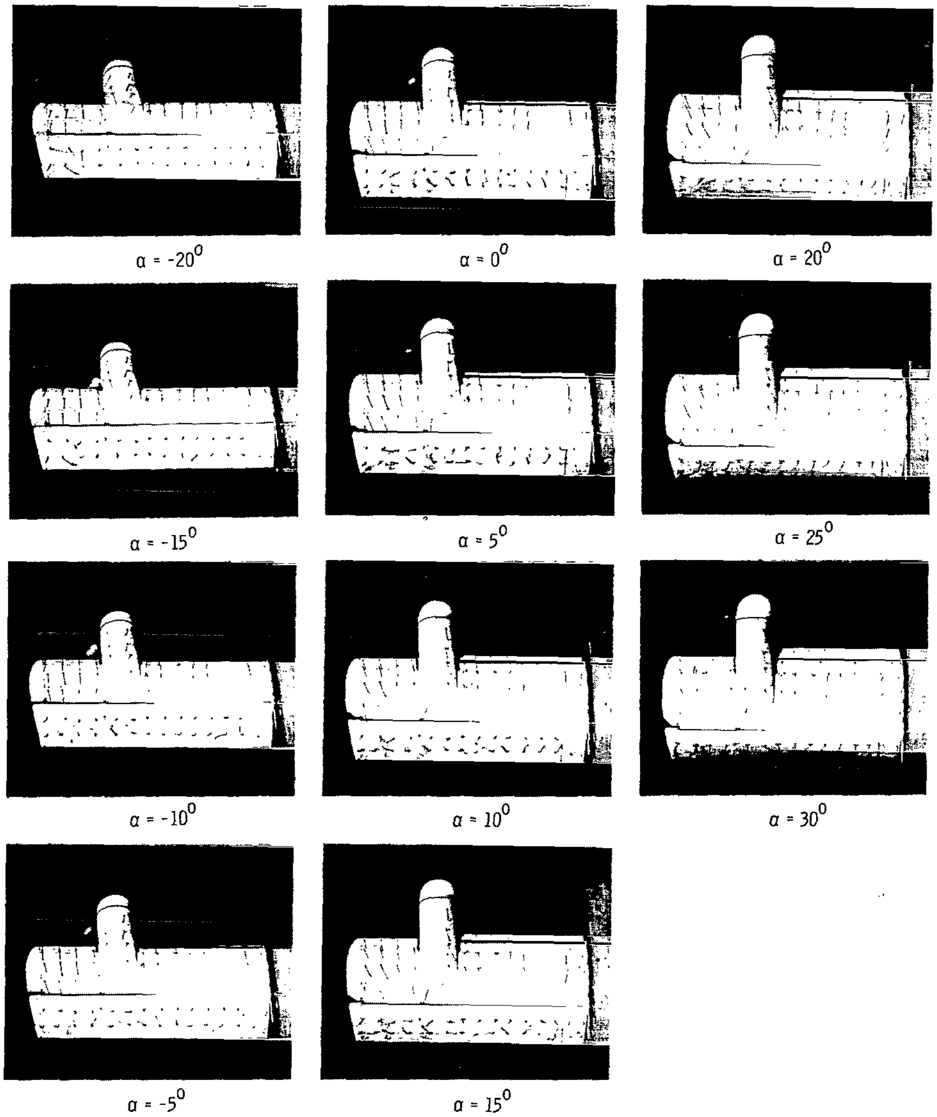
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7167

Figure 13.- Continued.



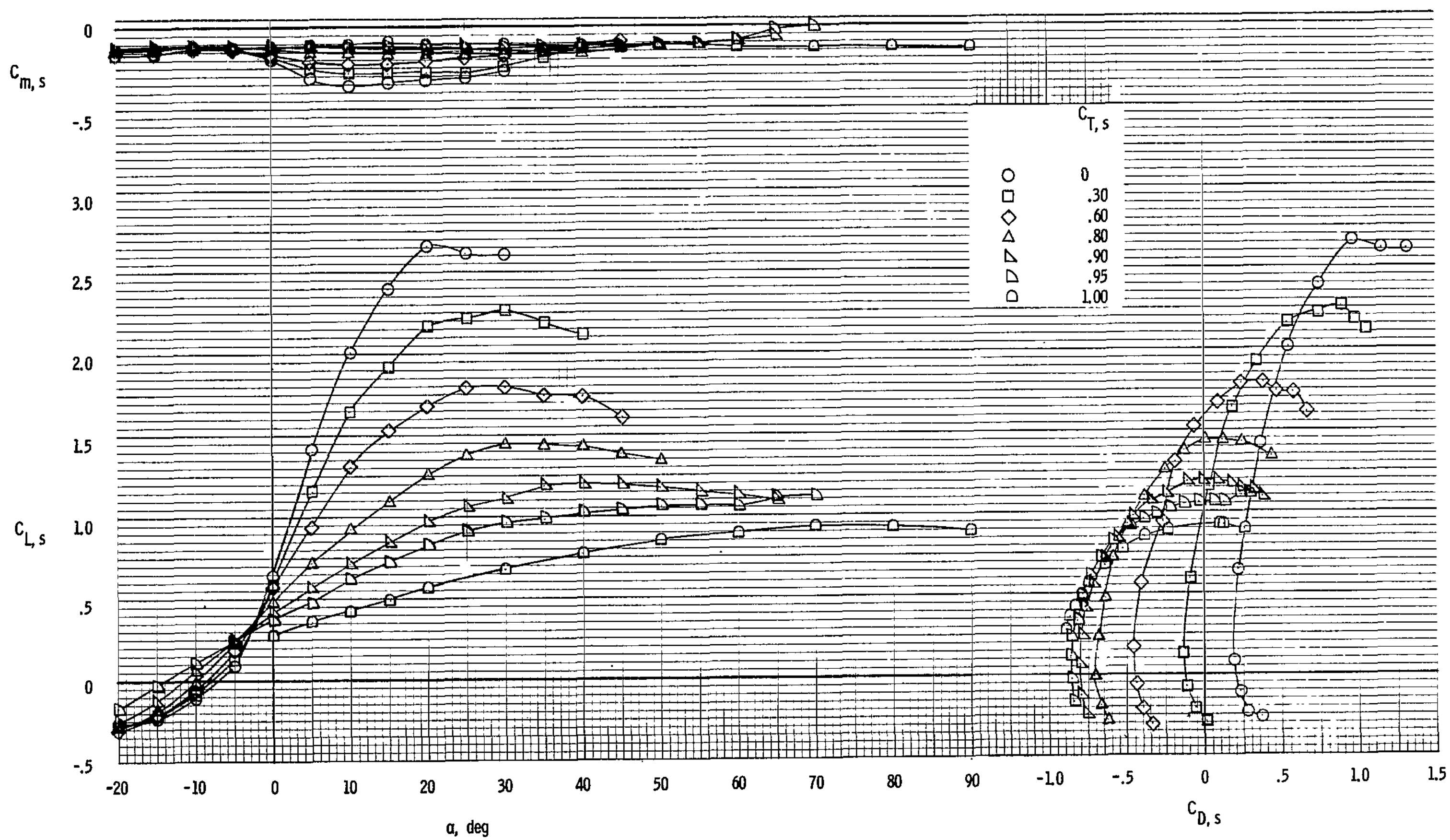
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7168

Figure 13.- Continued.



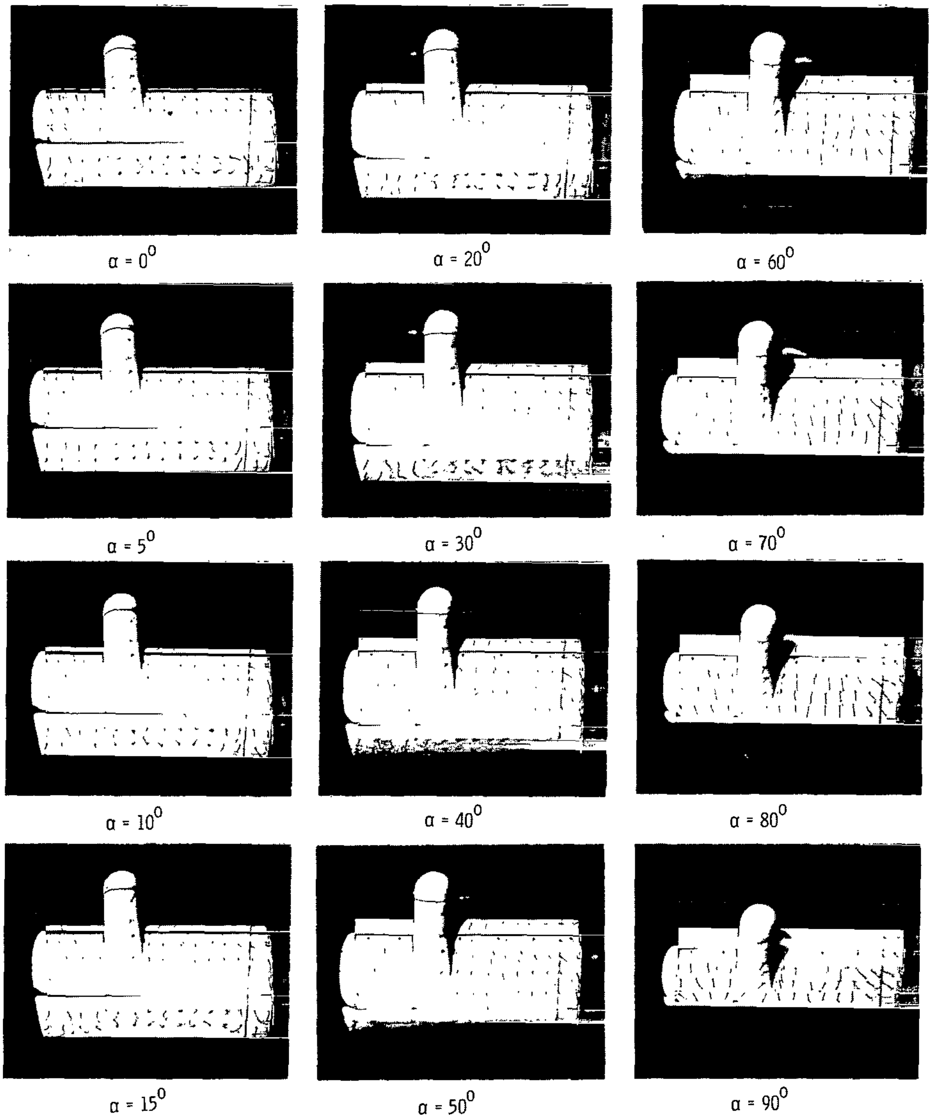
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7169

Figure 13.- Concluded.



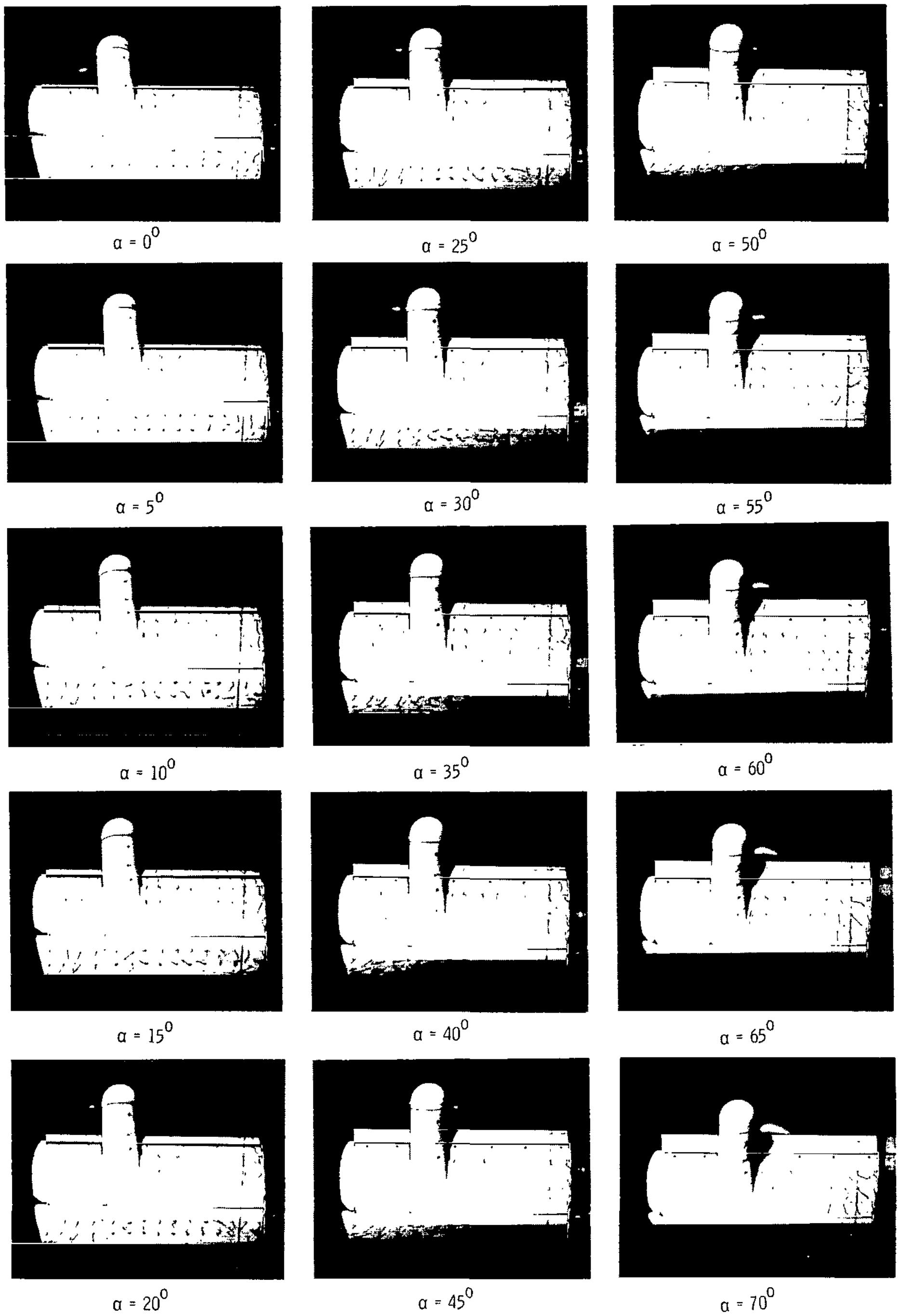
(a) Aerodynamic characteristics.

Figure 14.- Aerodynamic and flow characteristics of the model with the full-span slat deflected 20° and with the trailing-edge flap deflected 40°.



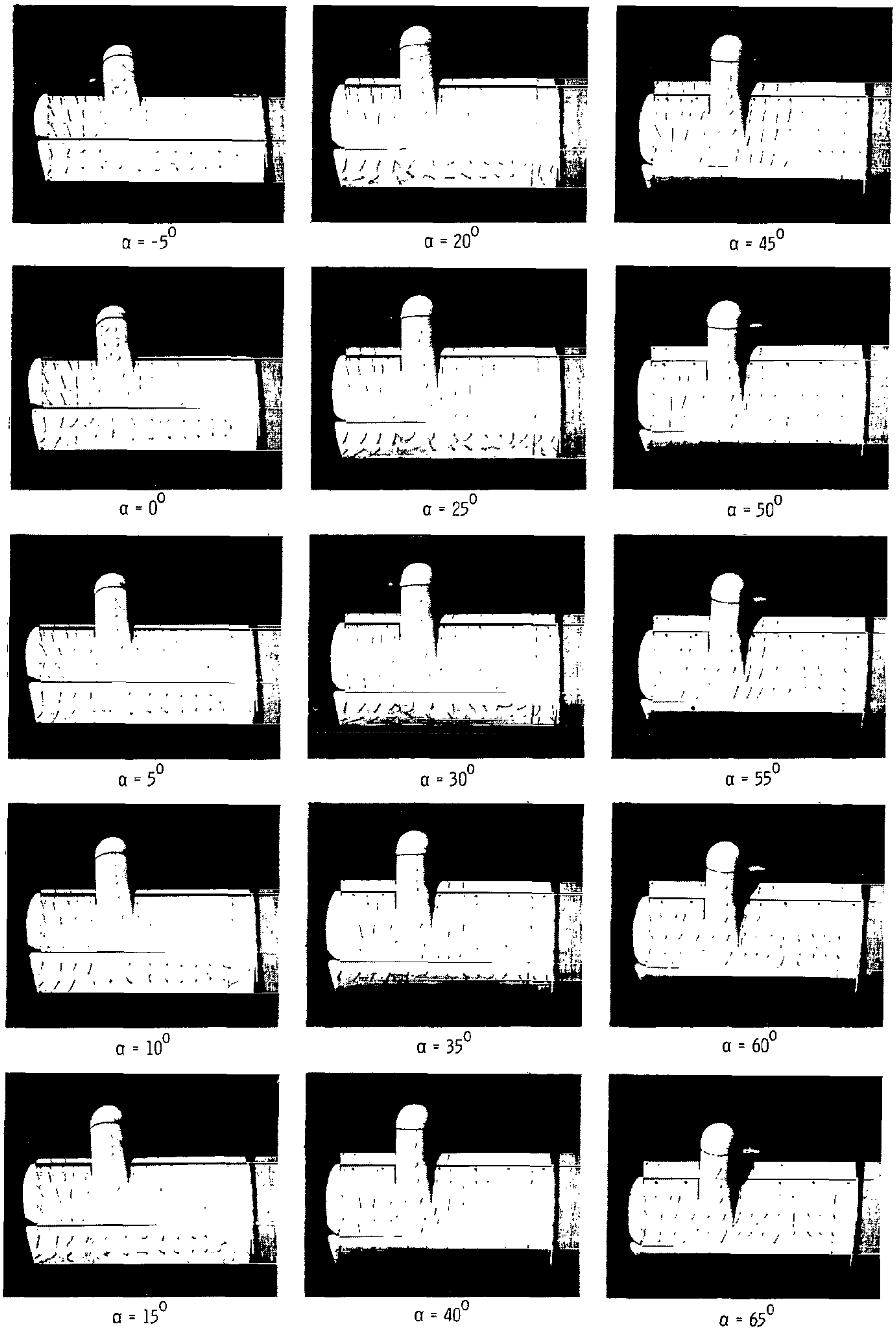
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7170

Figure 14.- Continued.



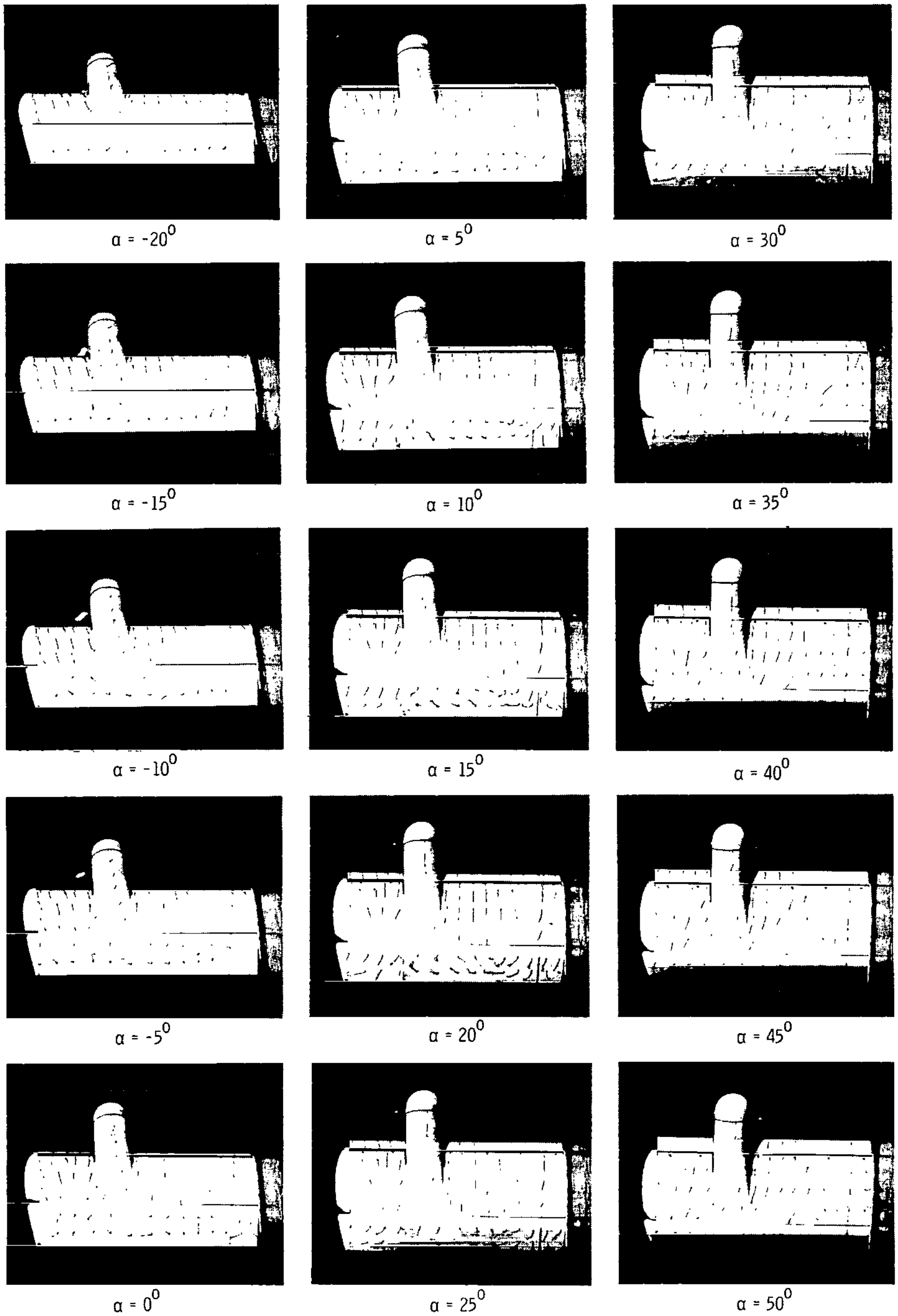
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7171

Figure 14.- Continued.



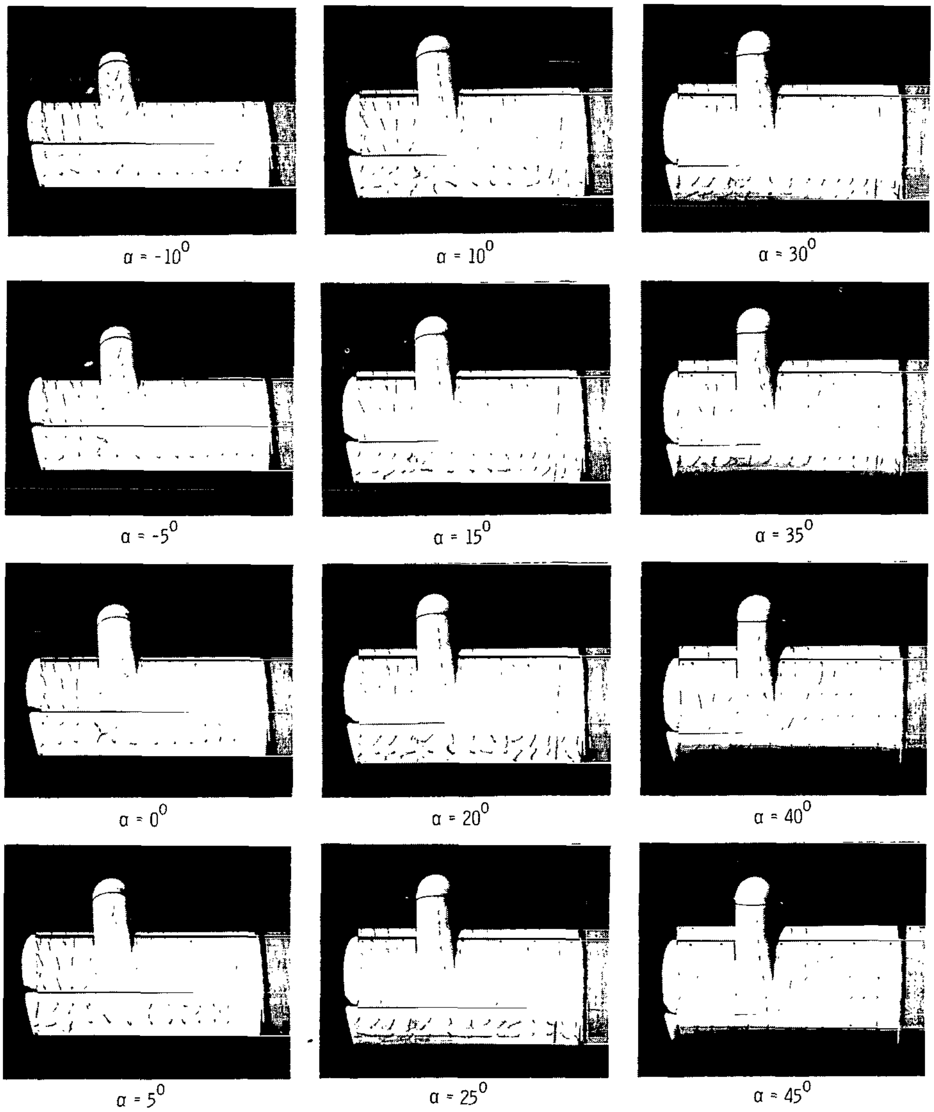
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7172

Figure 14.- Continued.



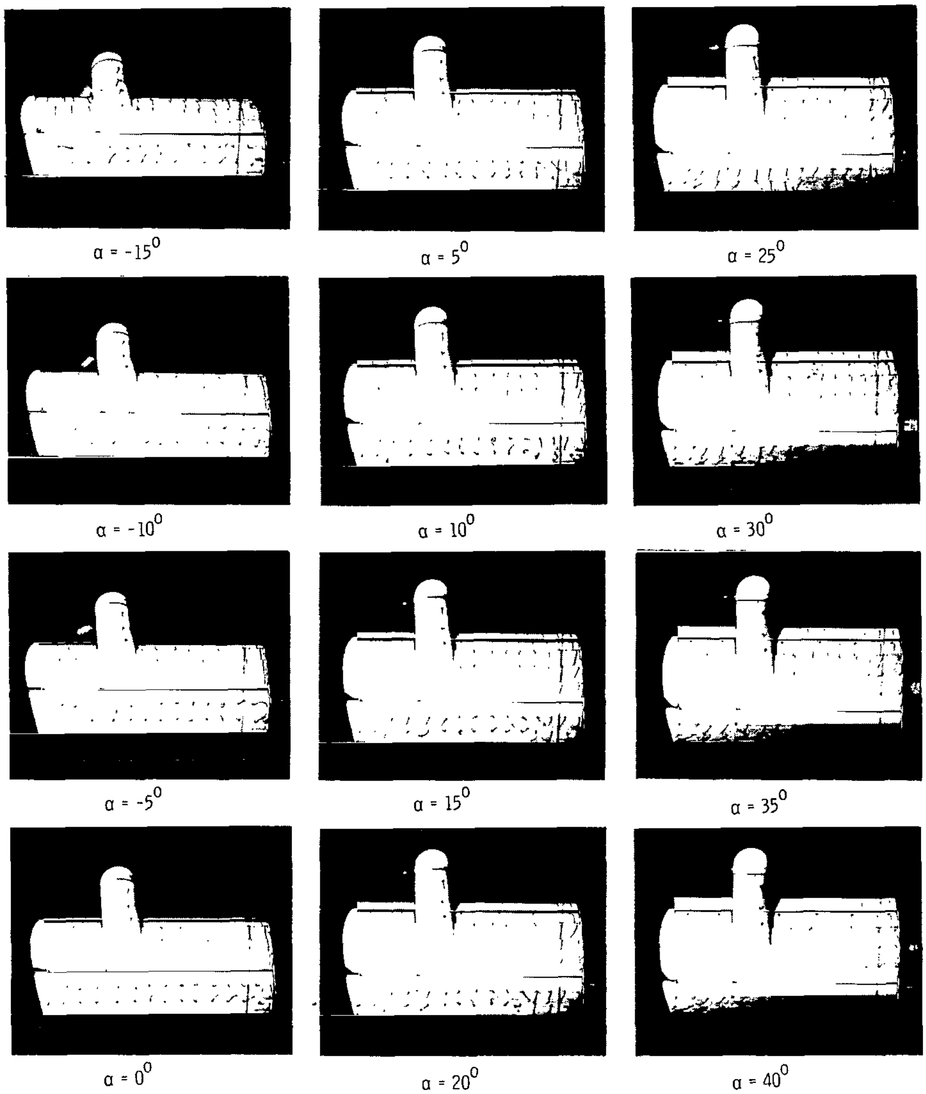
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7173

Figure 14.- Continued.



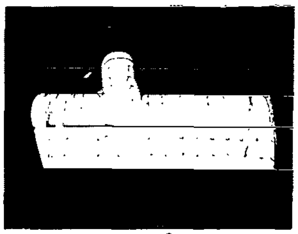
(f) Flow characteristics; $C_{T,s}$ = 0.60. L-64-7174

Figure 14.- Continued.

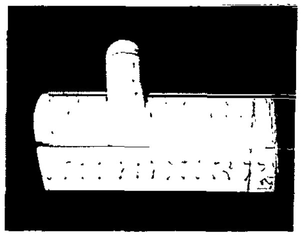


(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7175

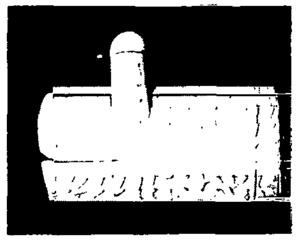
Figure 14.- Continued.



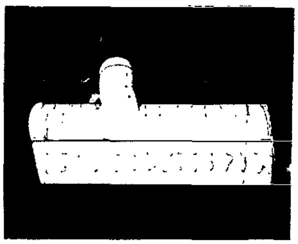
$\alpha = -20^0$



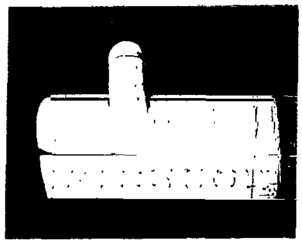
$\alpha = 0^0$



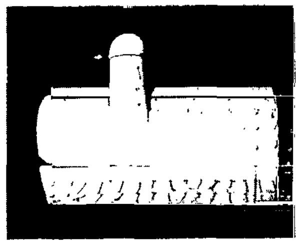
$\alpha = 20^0$



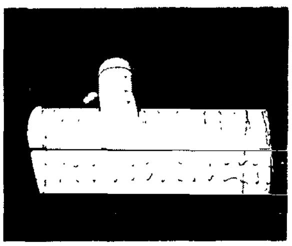
$\alpha = -15^0$



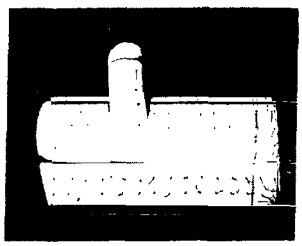
$\alpha = 5^0$



$\alpha = 25^0$



$\alpha = -10^0$



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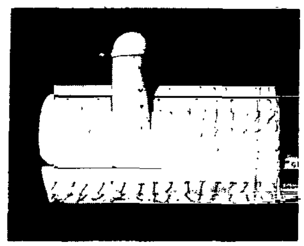
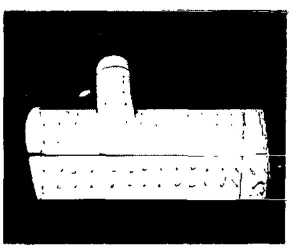
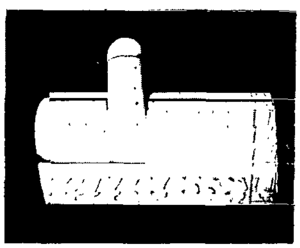


$\alpha = 30^0$



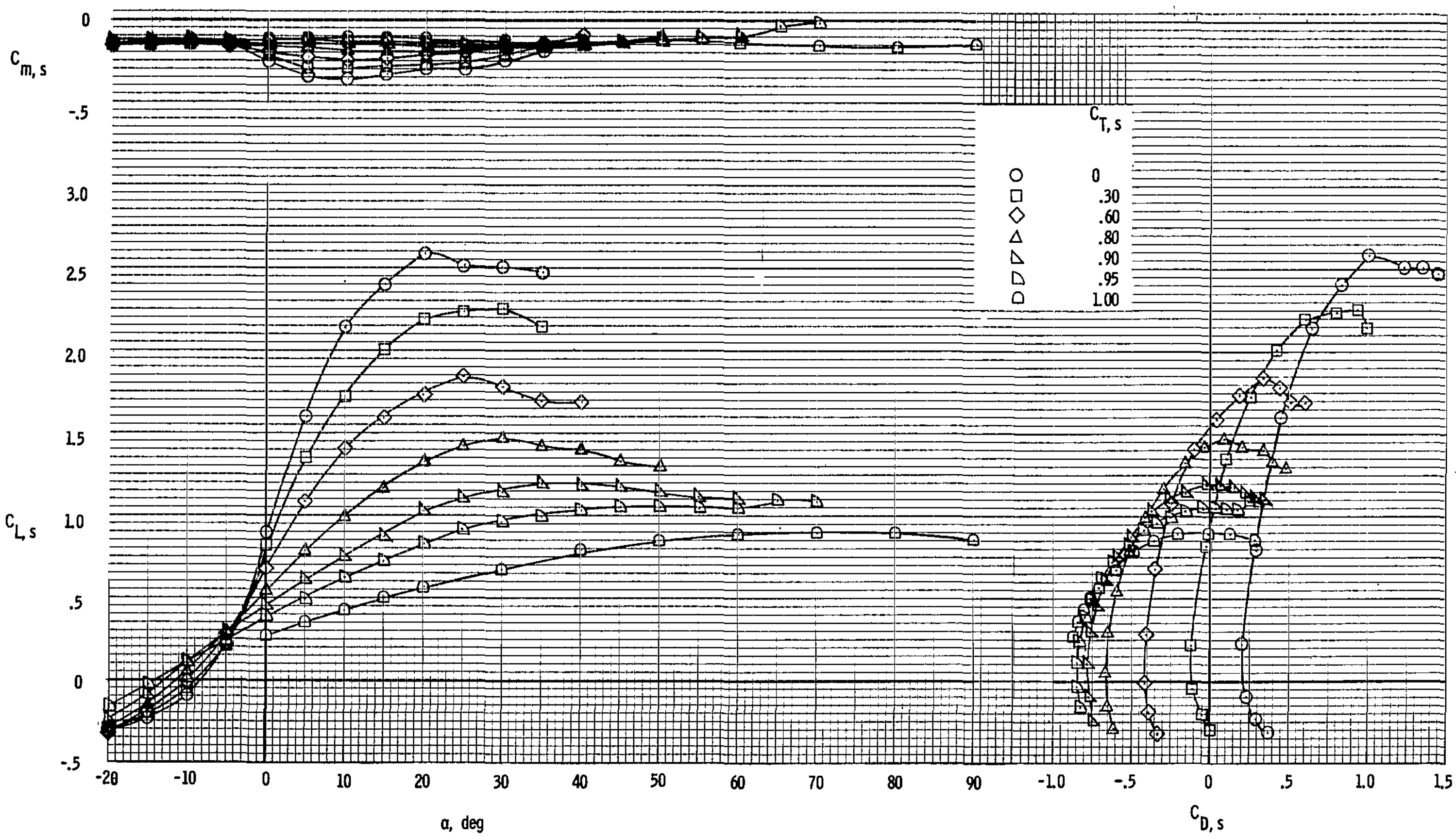
$\alpha = -5^0$



$\alpha = 15^0$

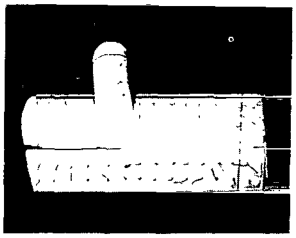
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7176

Figure 14.- Concluded.

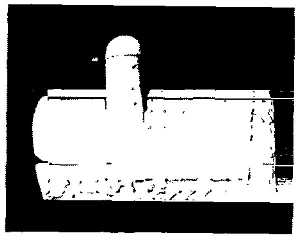


(a) Aerodynamic characteristics.

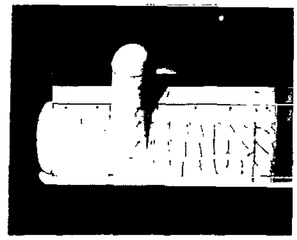
Figure 15.- Aerodynamic and flow characteristics of the model with the full-span slat deflected 20° and with the trailing-edge flap deflected 50°.



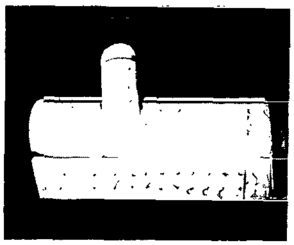
$\alpha = 0^{0}$



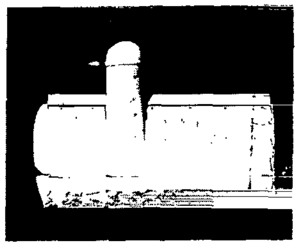
$\alpha = 20^{0}$



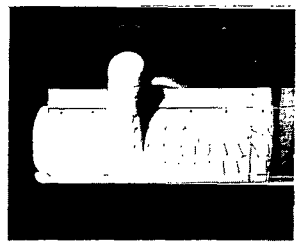
$\alpha = 60^{0}$



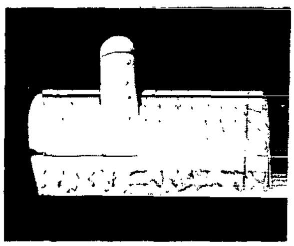
$\alpha = 5^{0}$



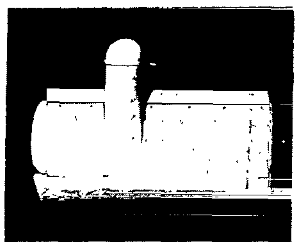
$\alpha = 30^{0}$



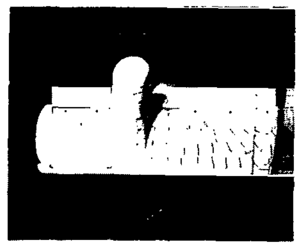
$\alpha = 70^{0}$



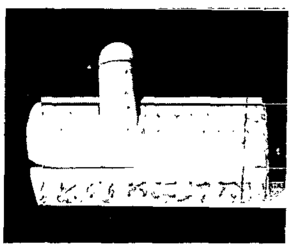
$\alpha = 10^{0}$



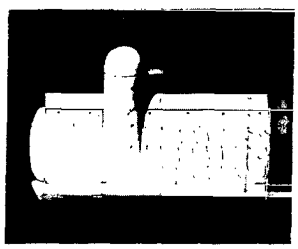
$\alpha = 40^{0}$



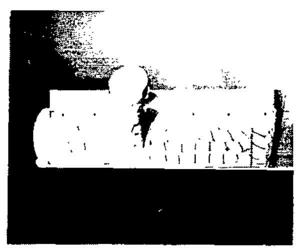
$\alpha = 80^{0}$



$\alpha = 15^{0}$



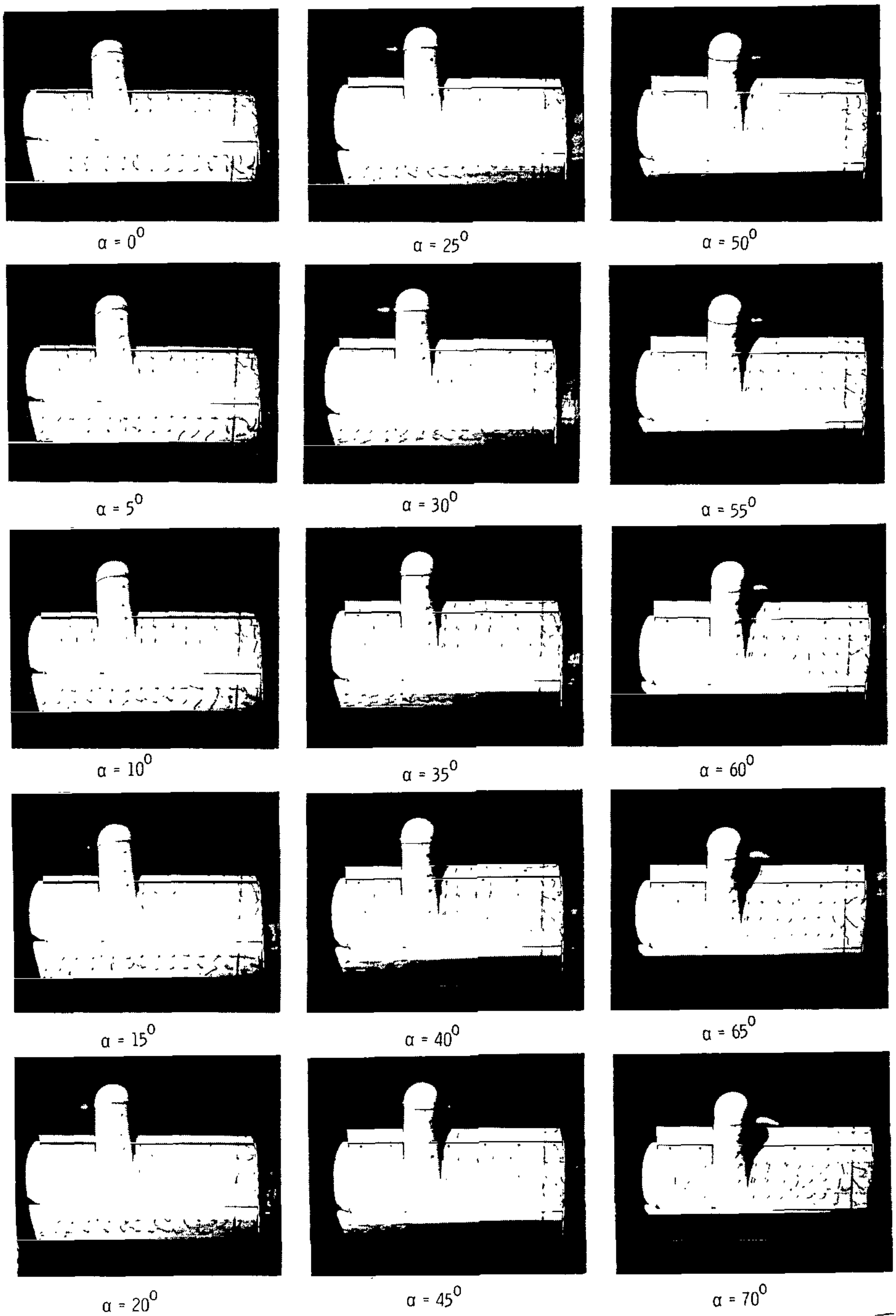
$\alpha = 50^{0}$



$\alpha = 90^{0}$

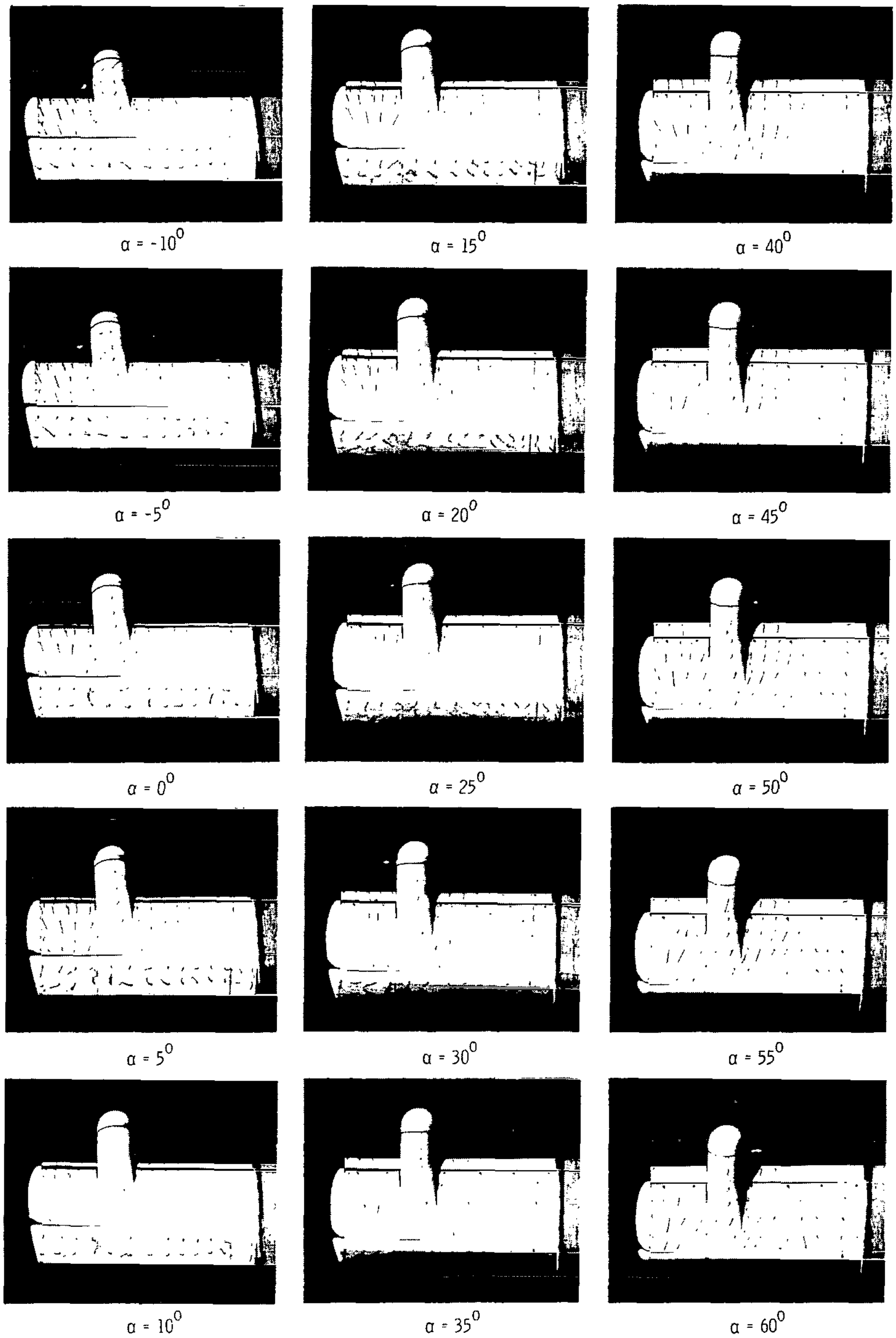
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7177

Figure 15.- Continued.



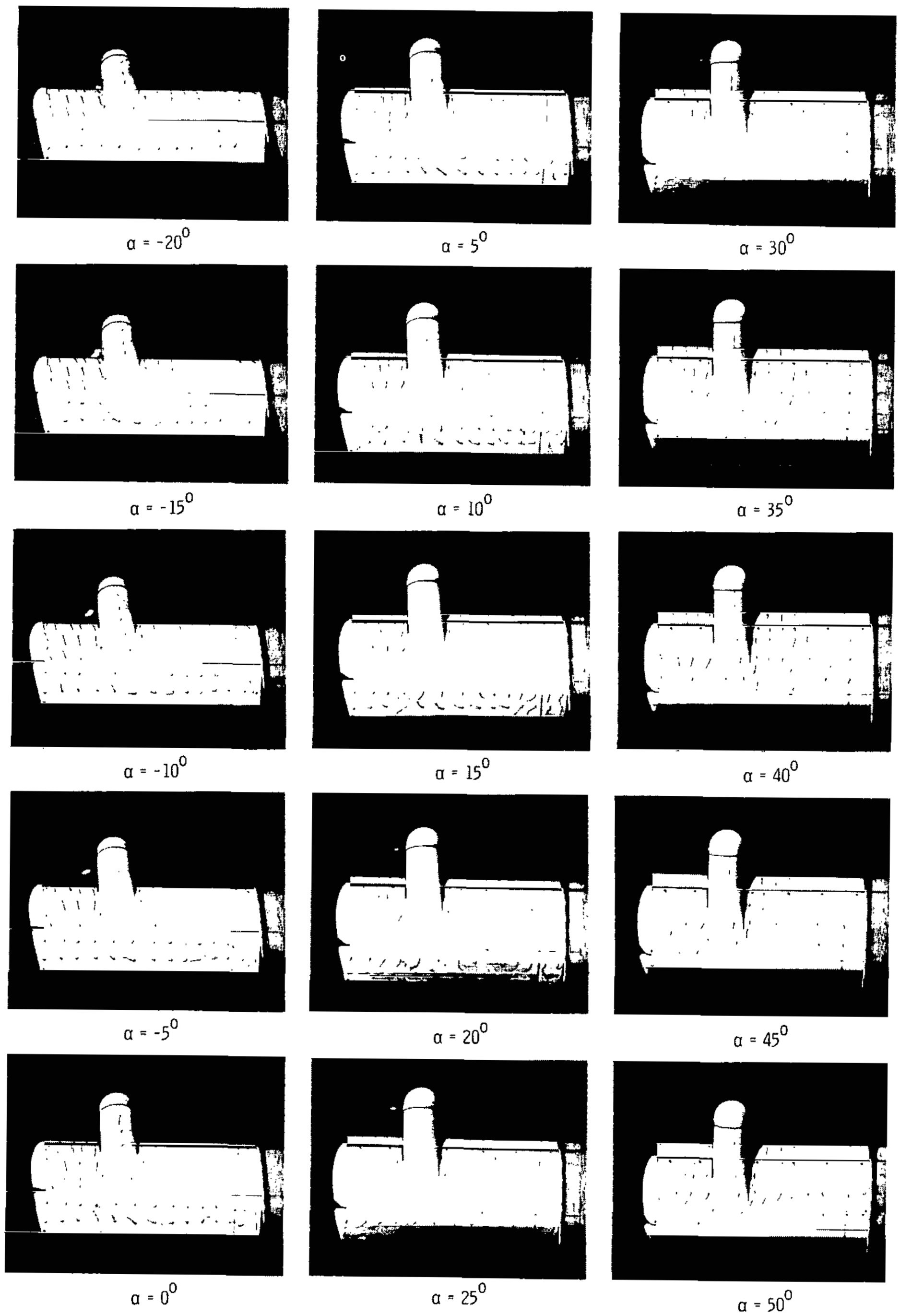
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7178

Figure 15.- Continued.



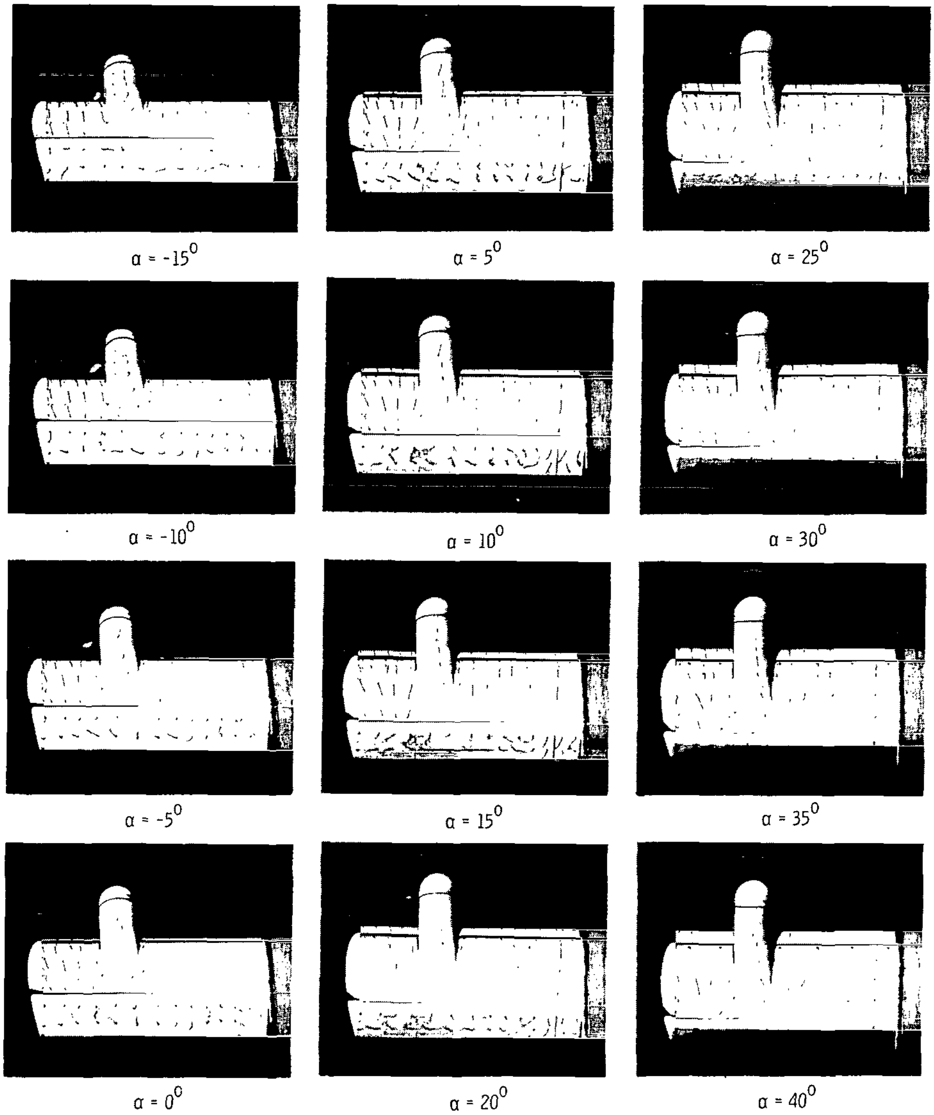
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7179

Figure 15.- Continued.



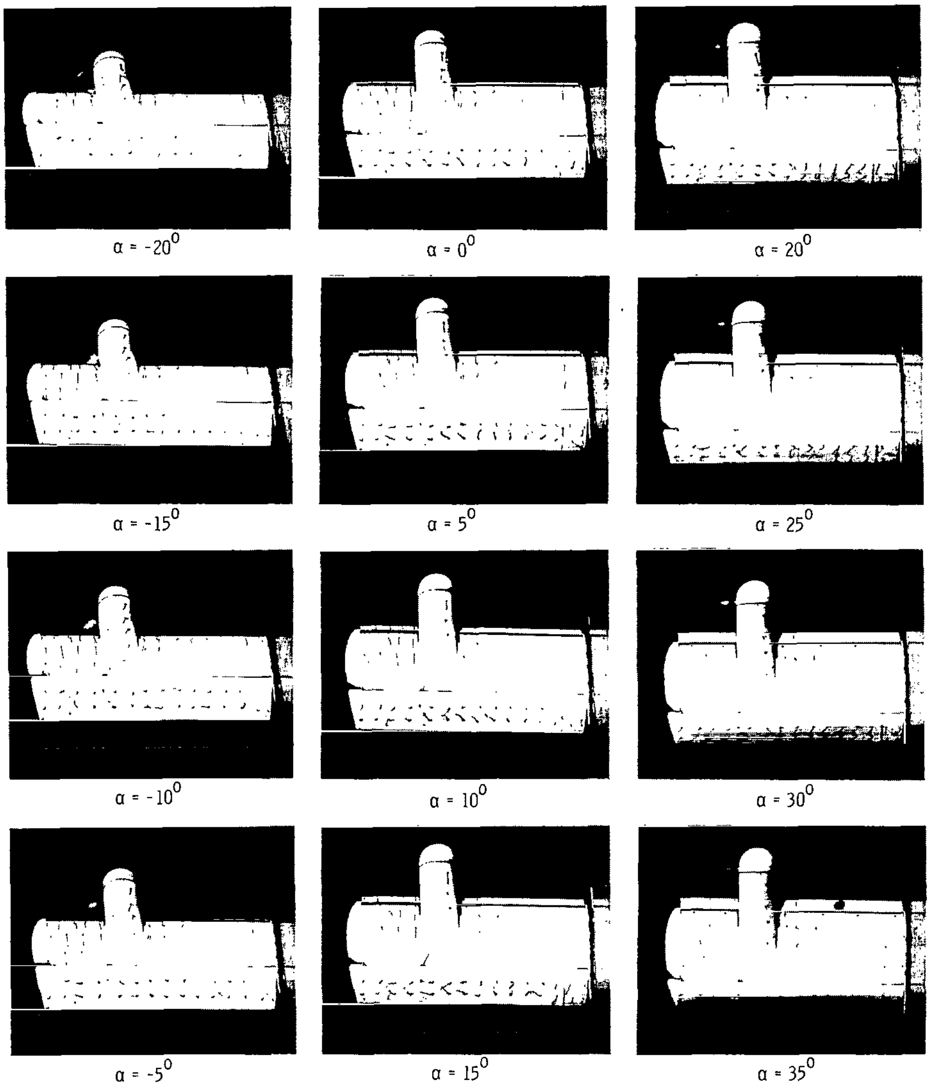
(e) Flow characteristics; $C_{T,s}$ = 0.80. L-64-7180

Figure 15.- Continued.



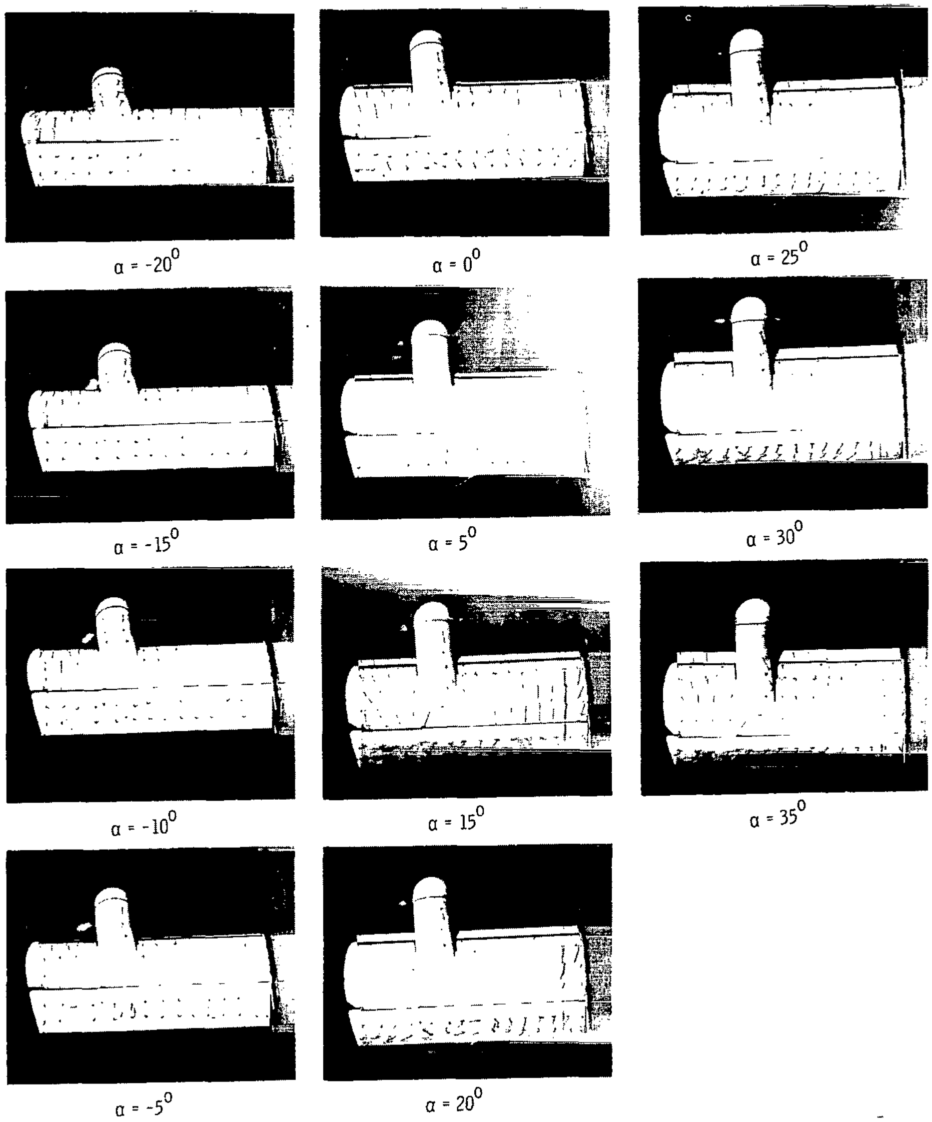
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7181

Figure 15.- Continued.



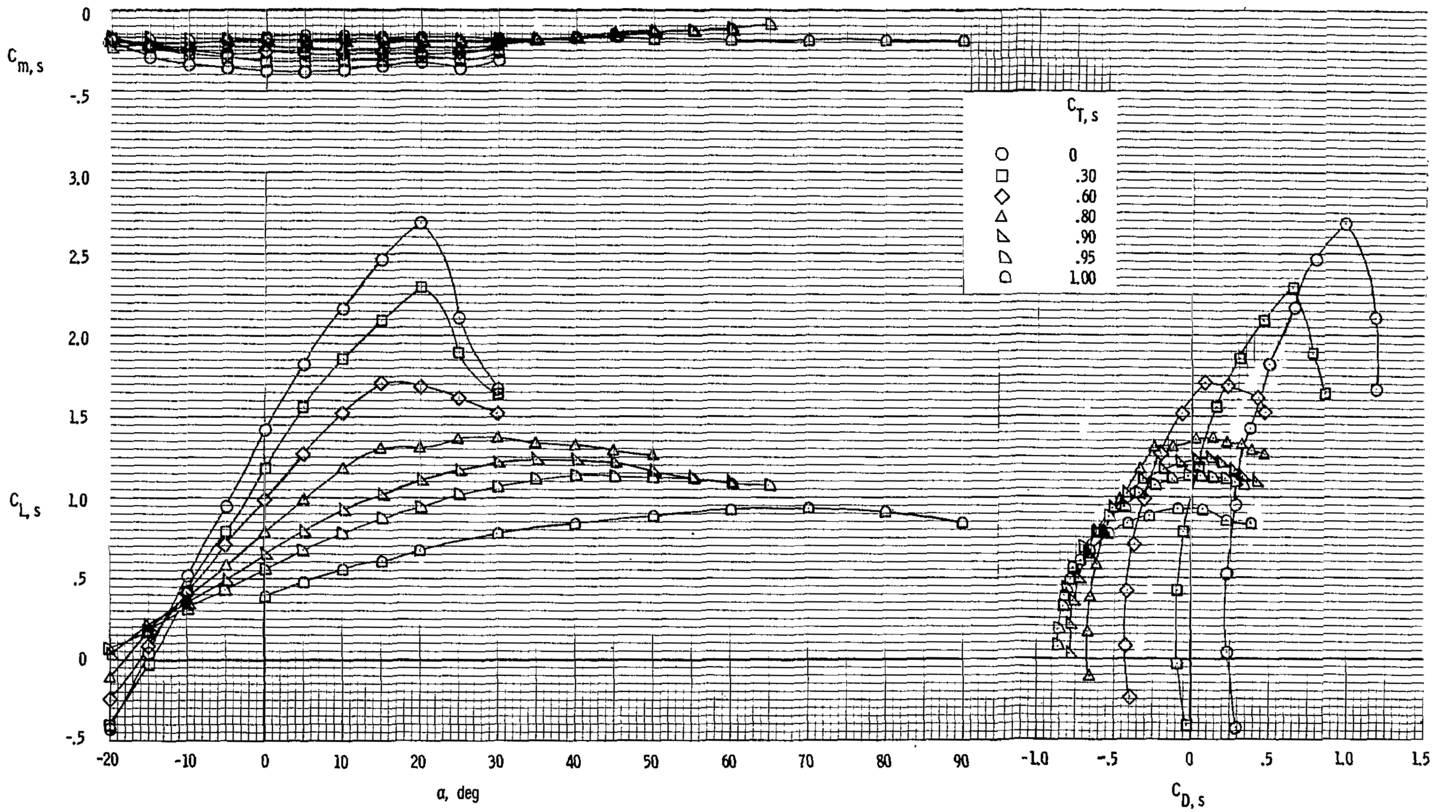
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7182

Figure 15.- Continued.



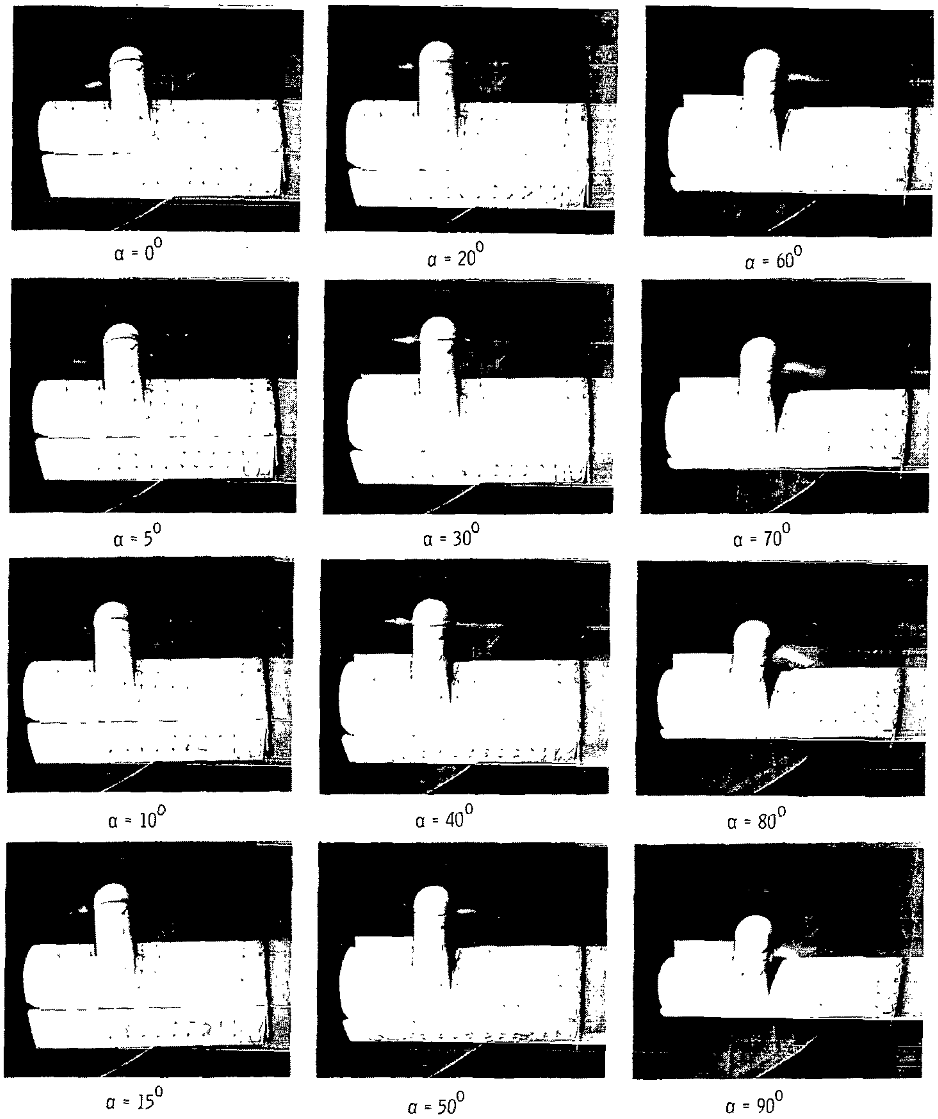
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7183

Figure 15.- Concluded.



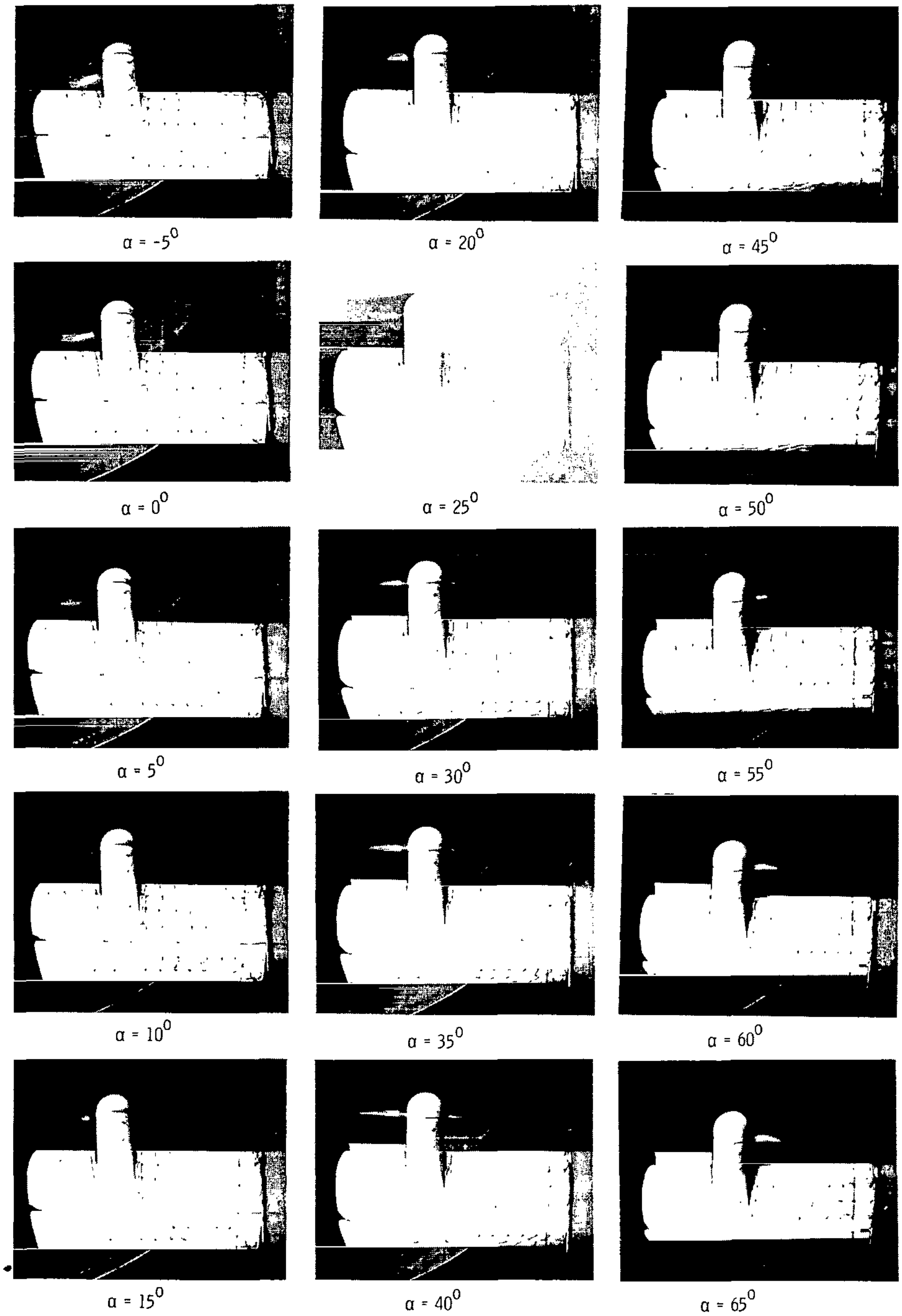
(a) Aerodynamic characteristics.

Figure 16.- Aerodynamic and flow characteristics of the model with the outboard section of the Krueger flap deflected 50° and with the trailing-edge flap deflected 50°.



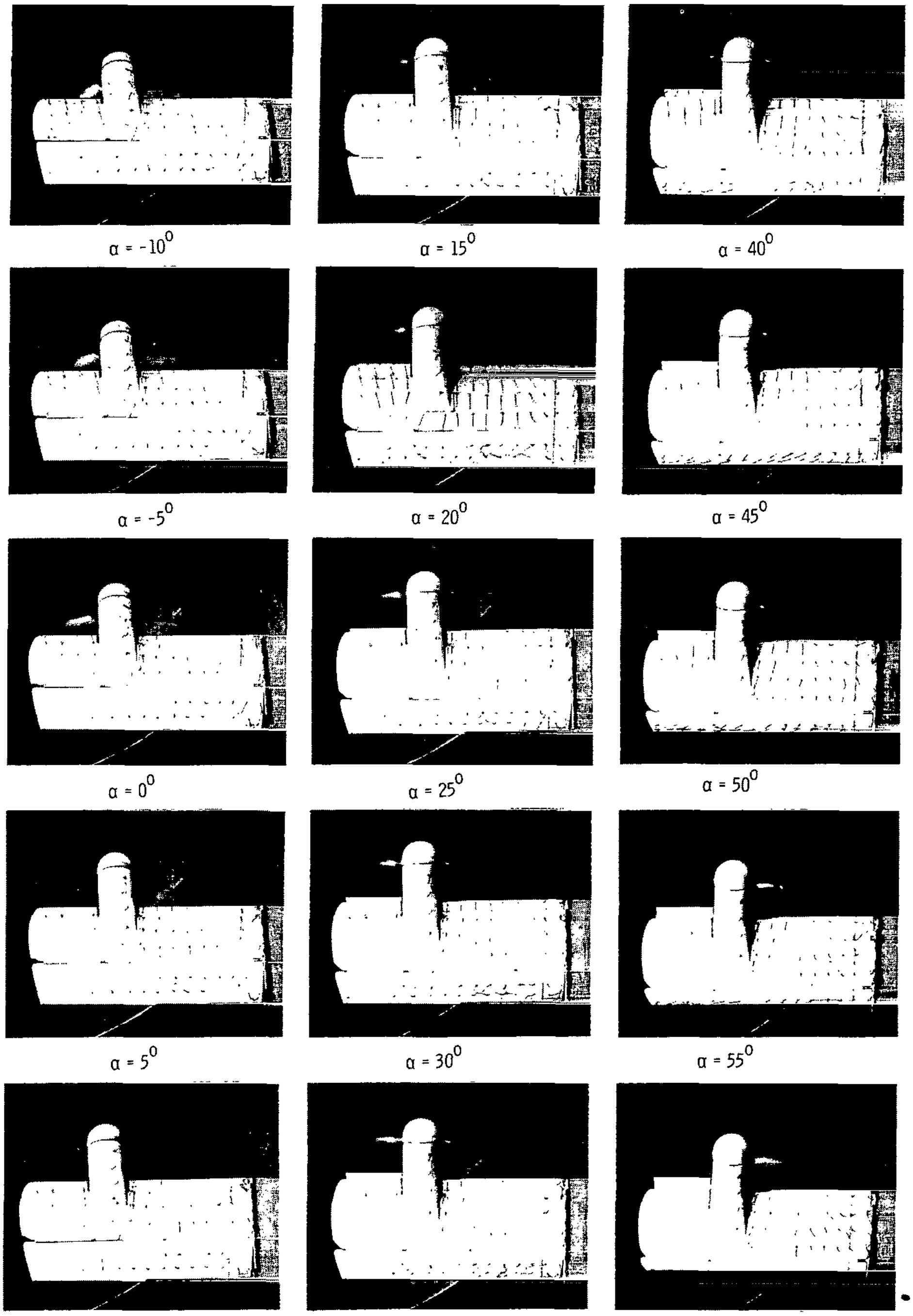
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7184

Figure 16.- Continued.



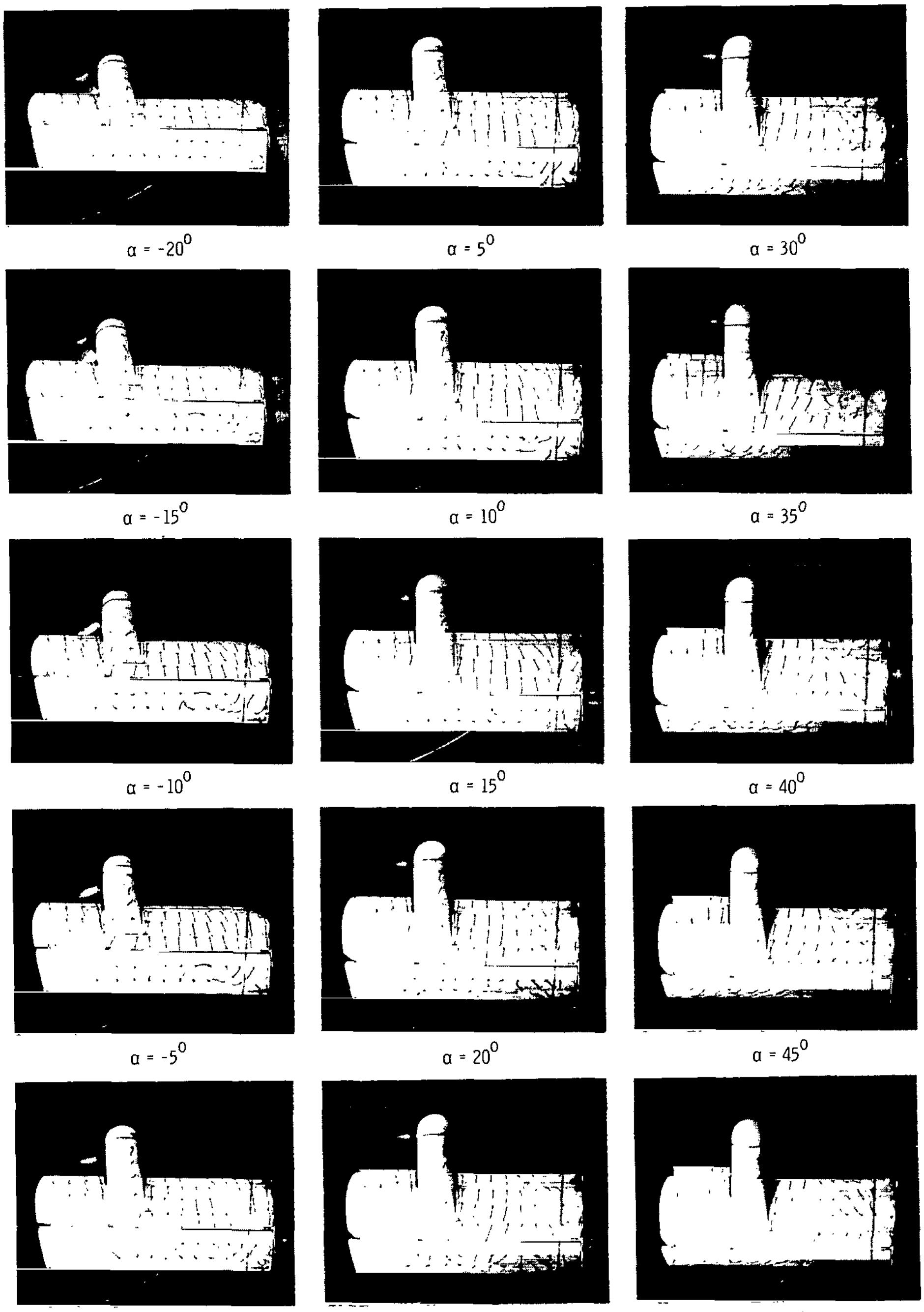
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7185

Figure 16.- Continued.



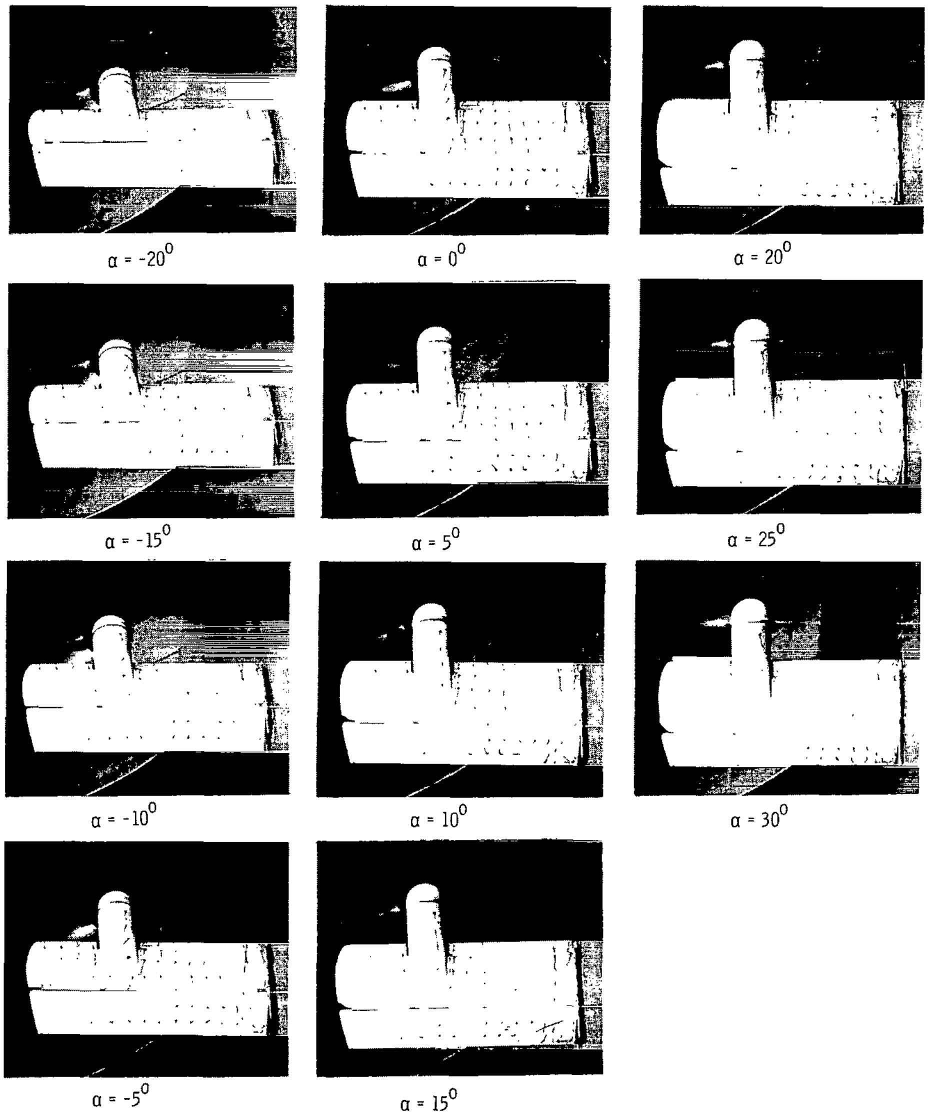
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7186

Figure 16.- Continued.



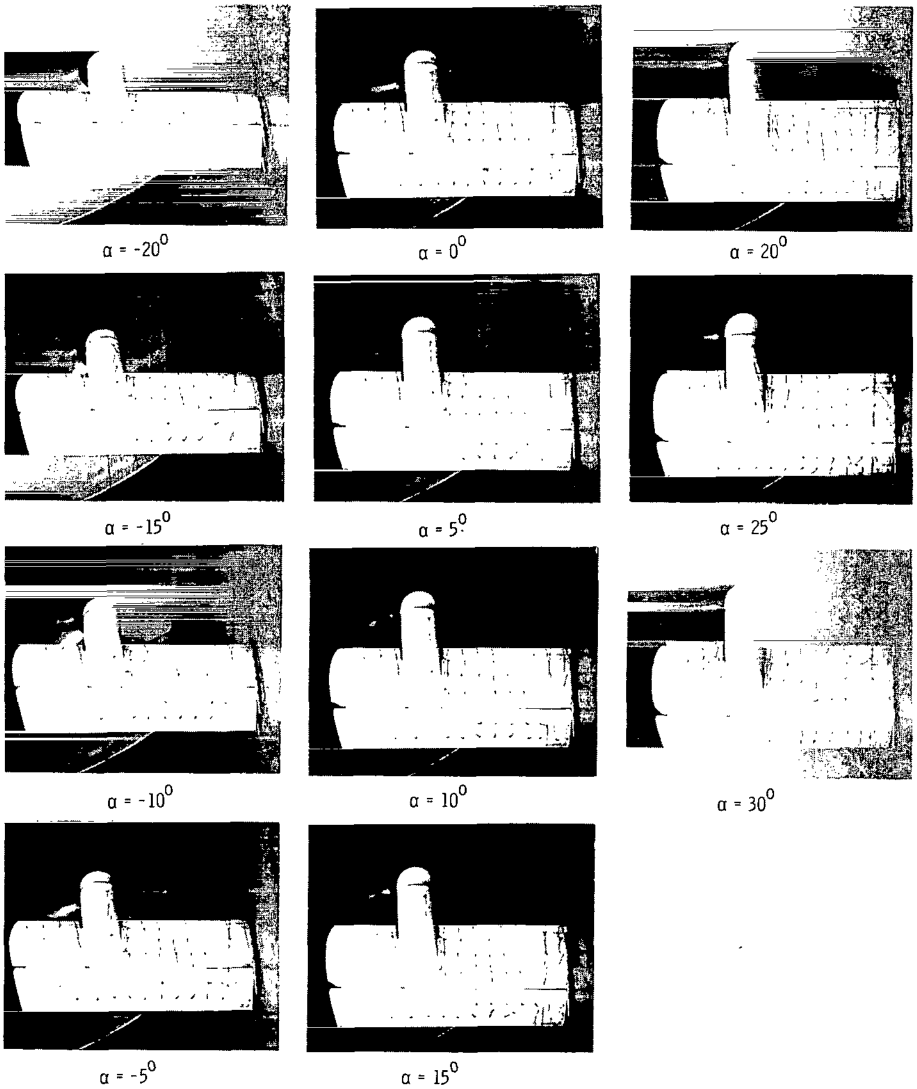
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7187

Figure 16.- Continued.



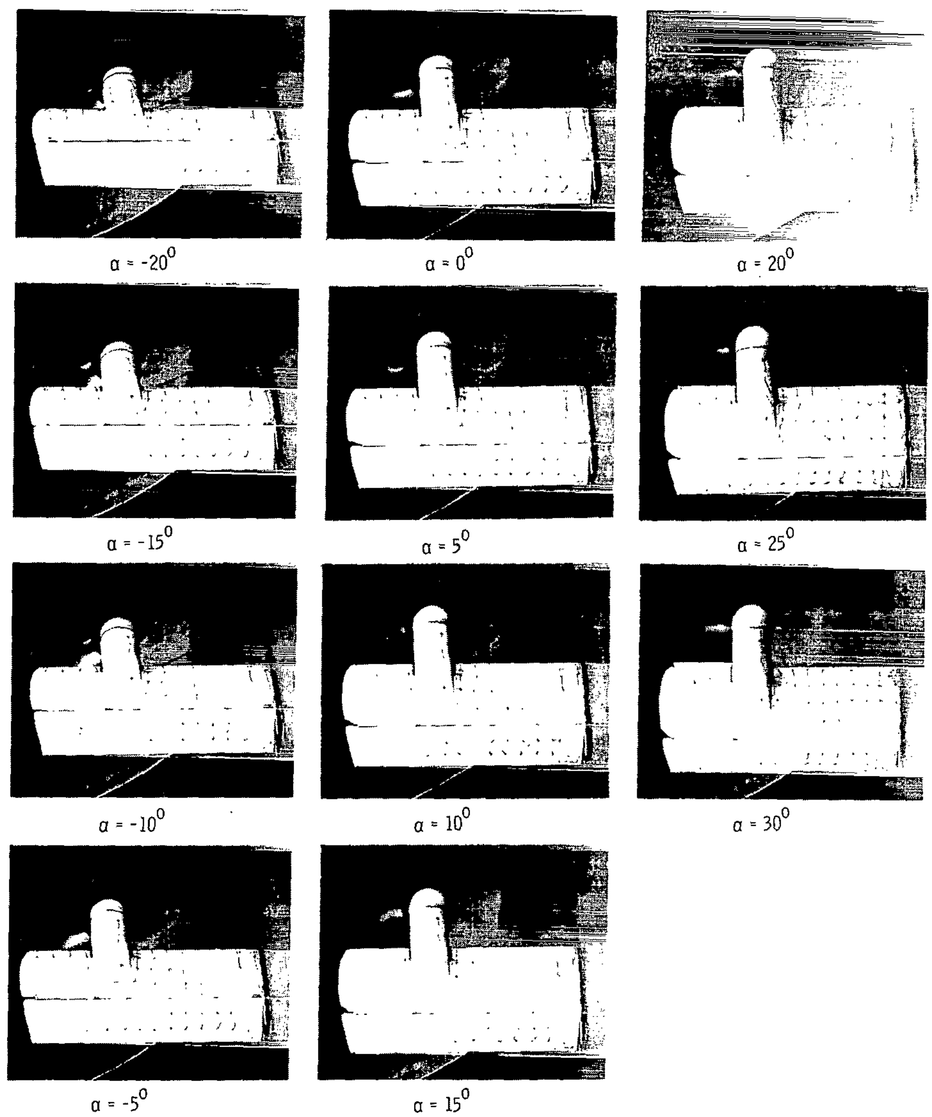
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7188

Figure 16.- Continued.



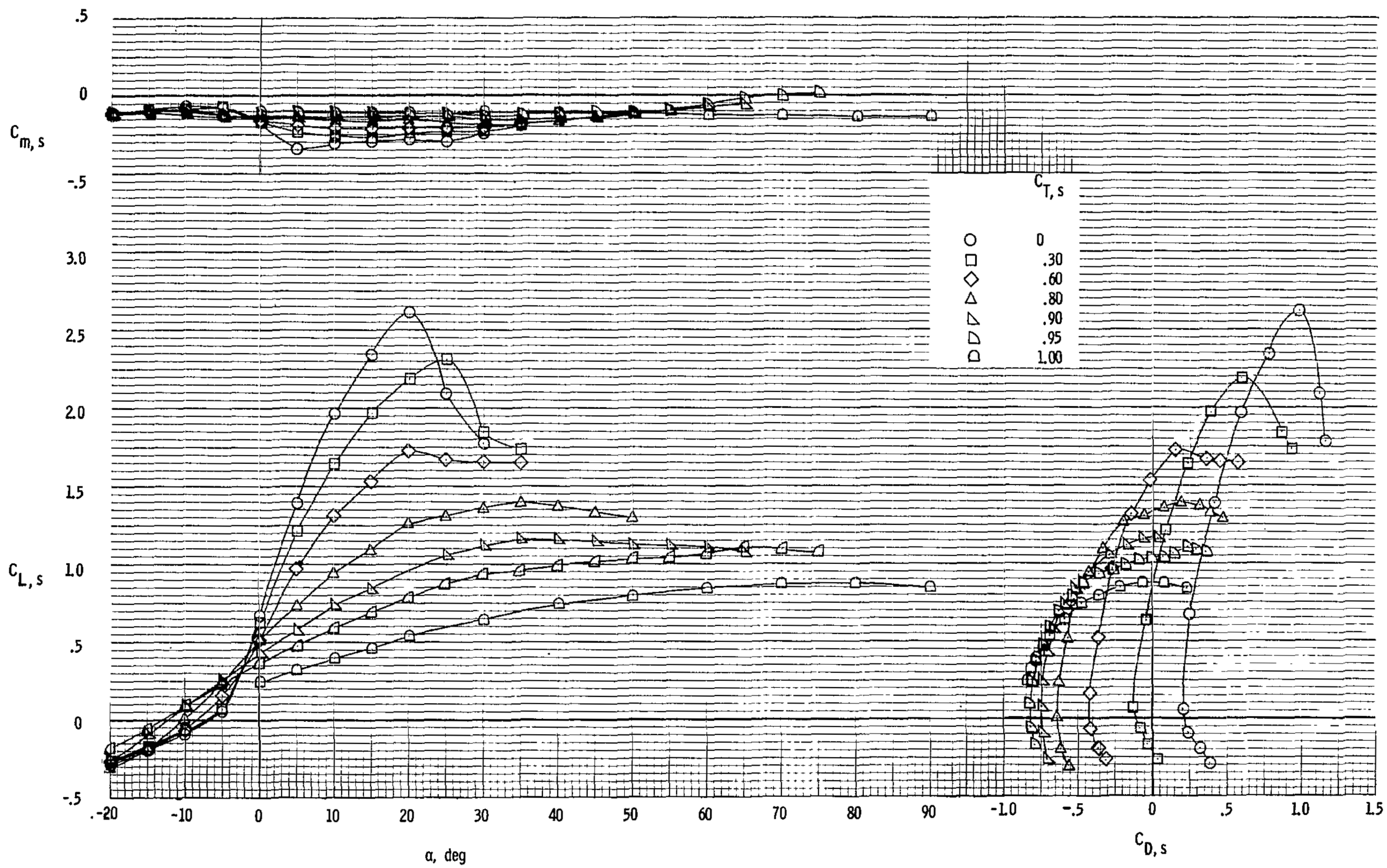
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7189

Figure 16.- Continued.



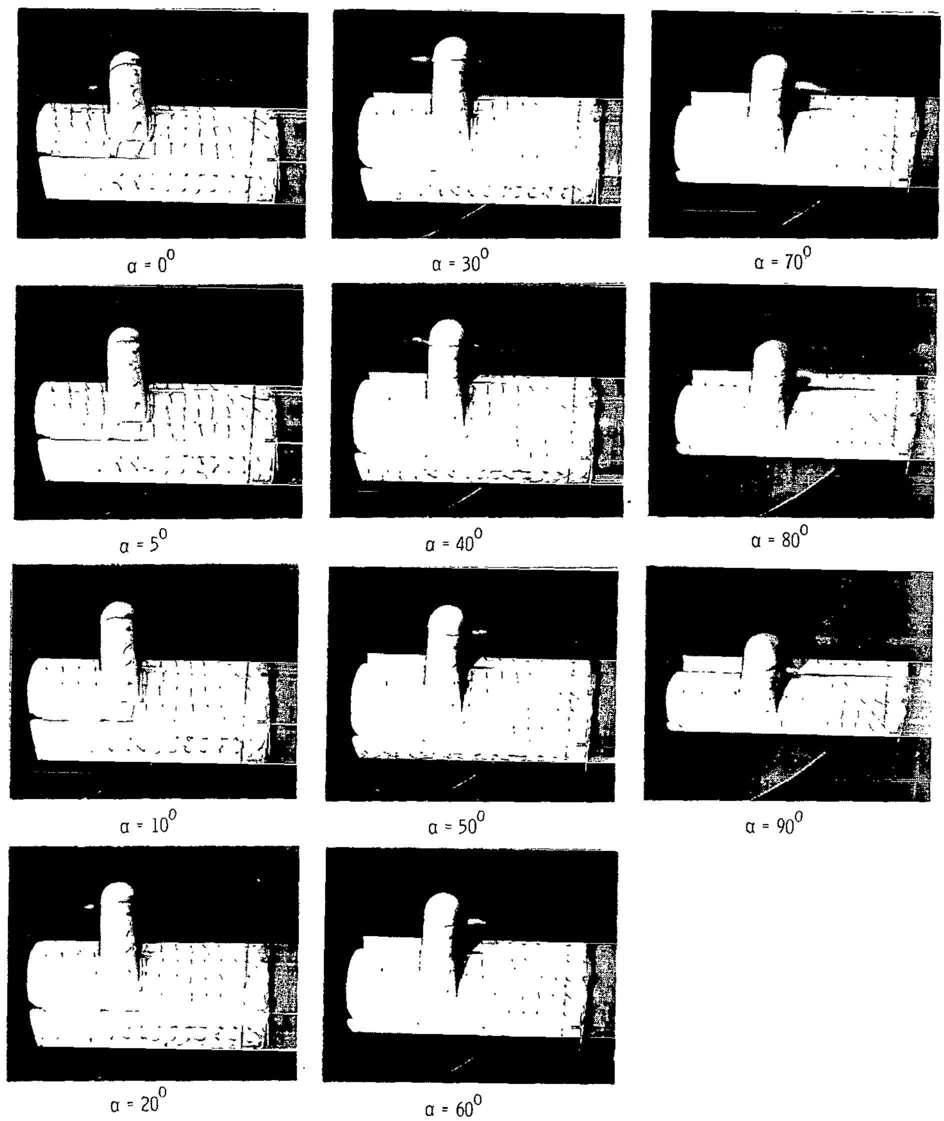
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7190

Figure 16.- Concluded.



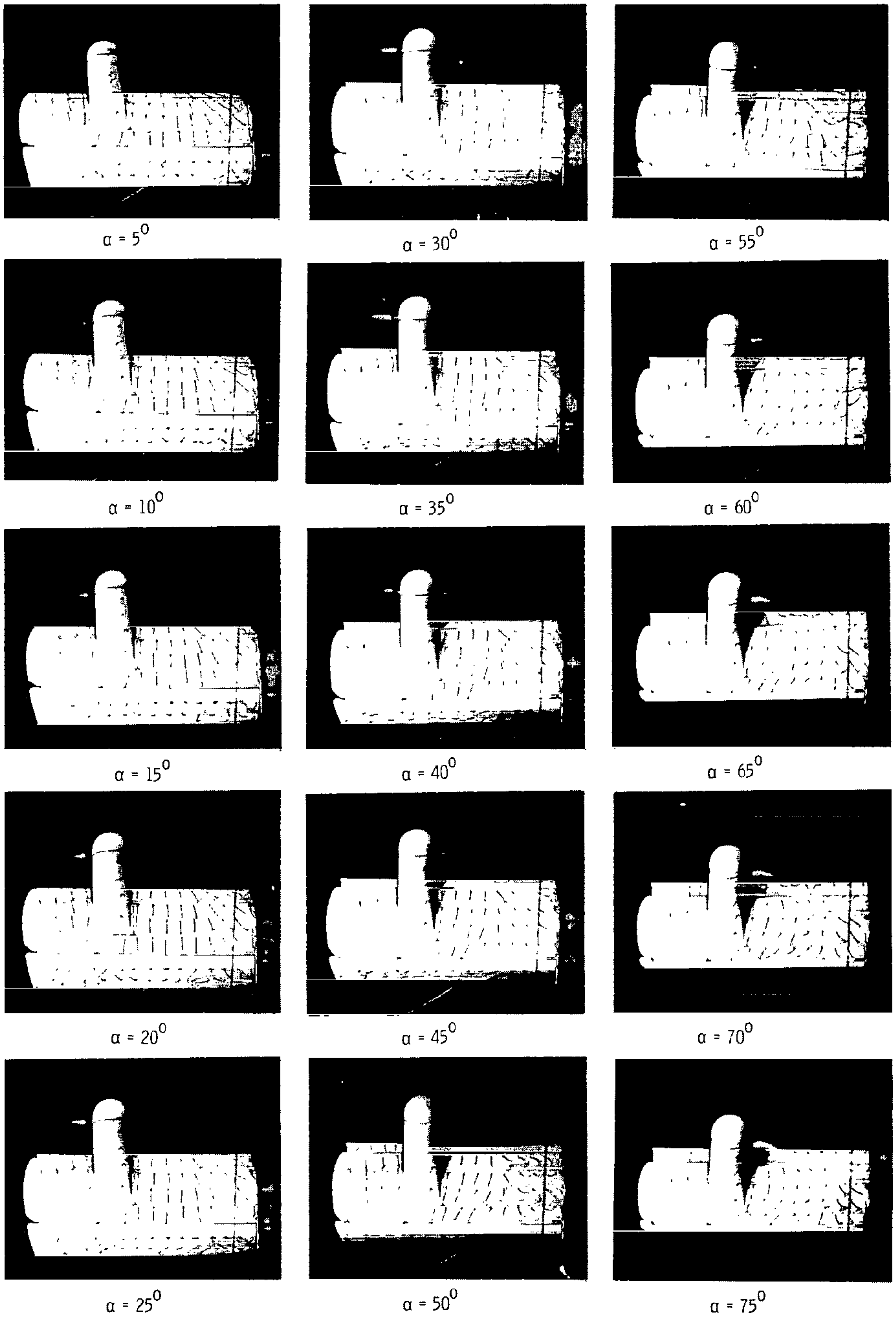
(a) Aerodynamic characteristics.

Figure 17.- Aerodynamic and flow characteristics of the model with the full-span Krueger flap deflected 50° and with the trailing-edge flap deflected 50°.



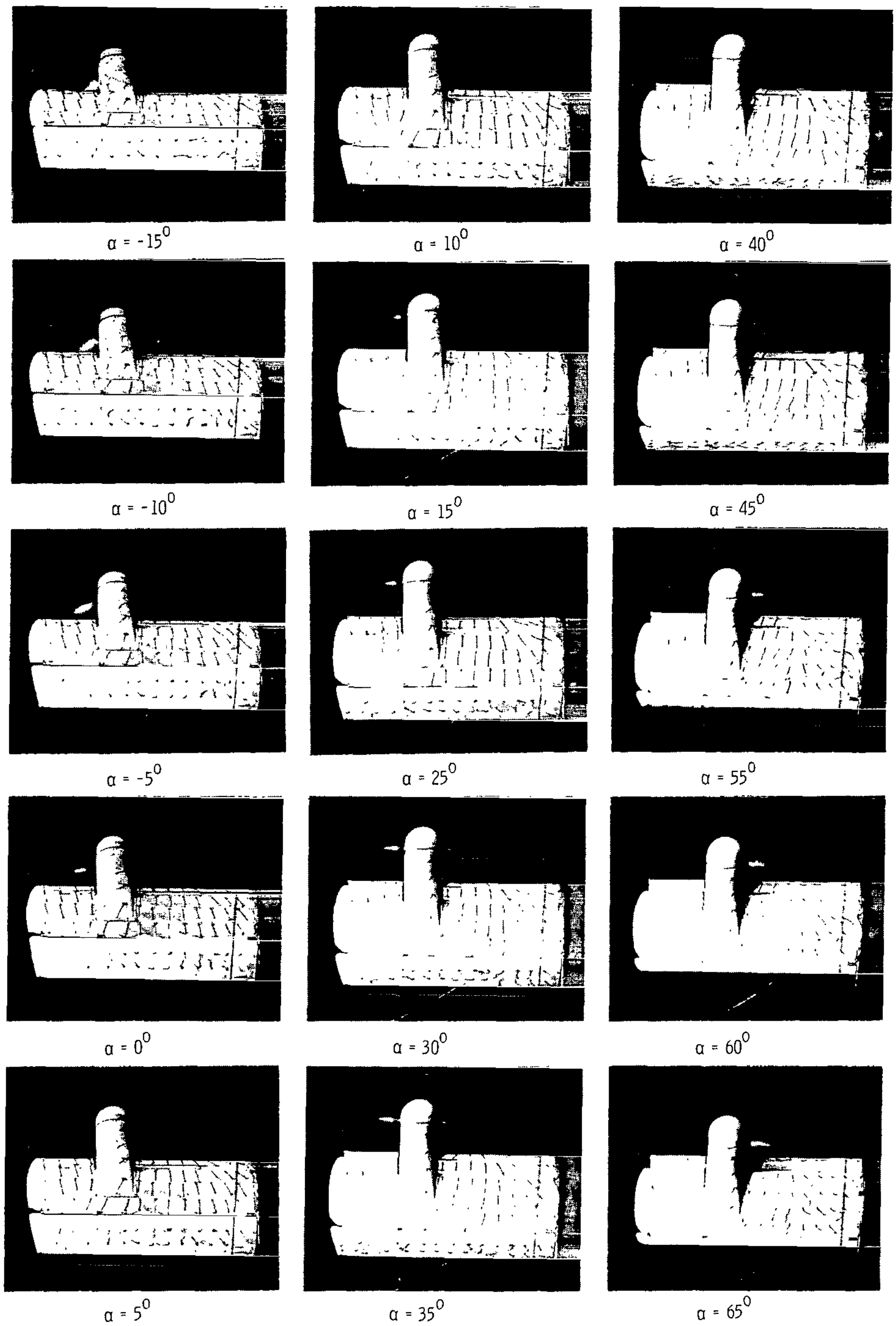
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7191

Figure 17.- Continued.



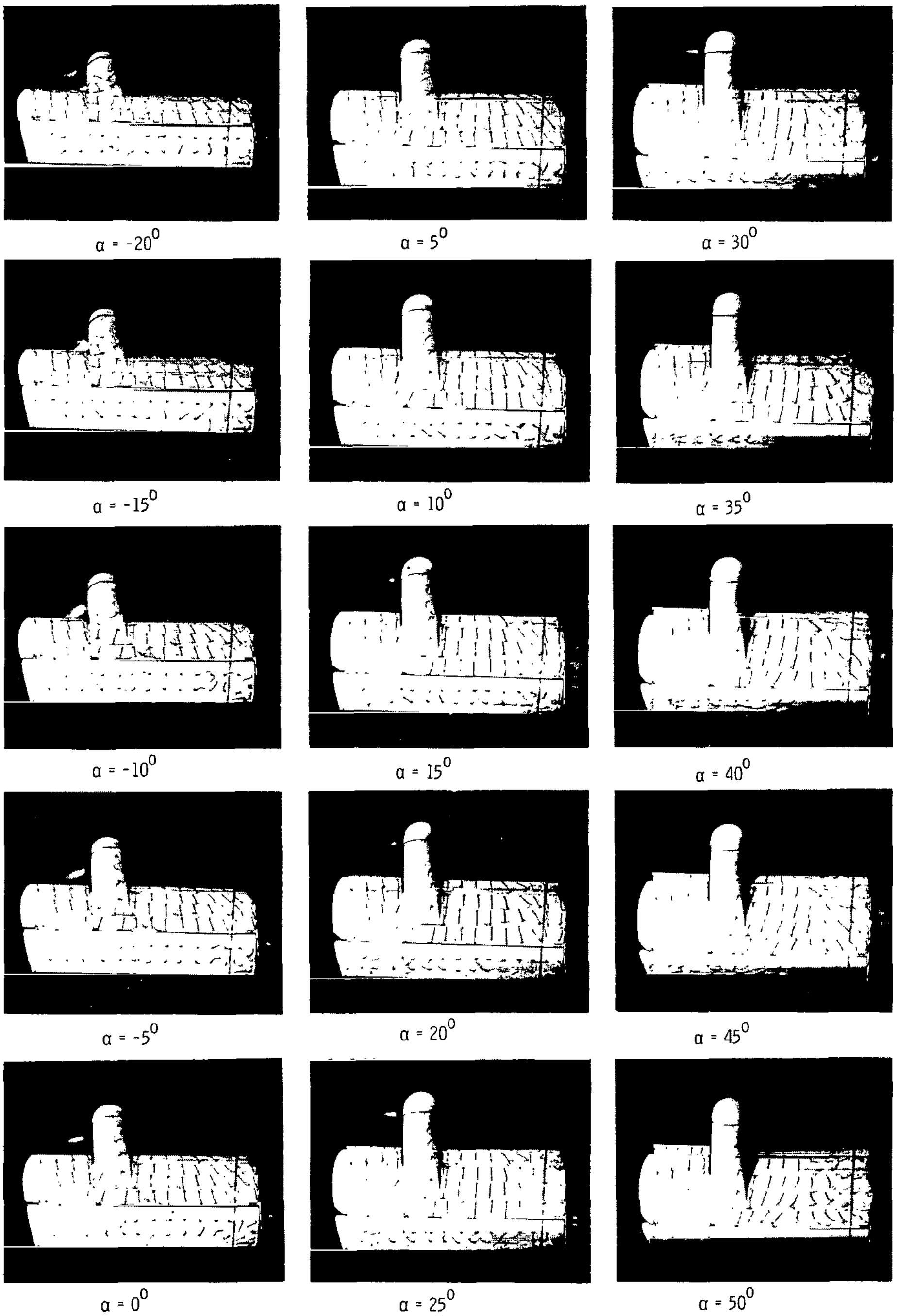
(c) Flow characteristics; $C_{T,s}$ = 0.95. L-64-7192

Figure 17.- Continued.



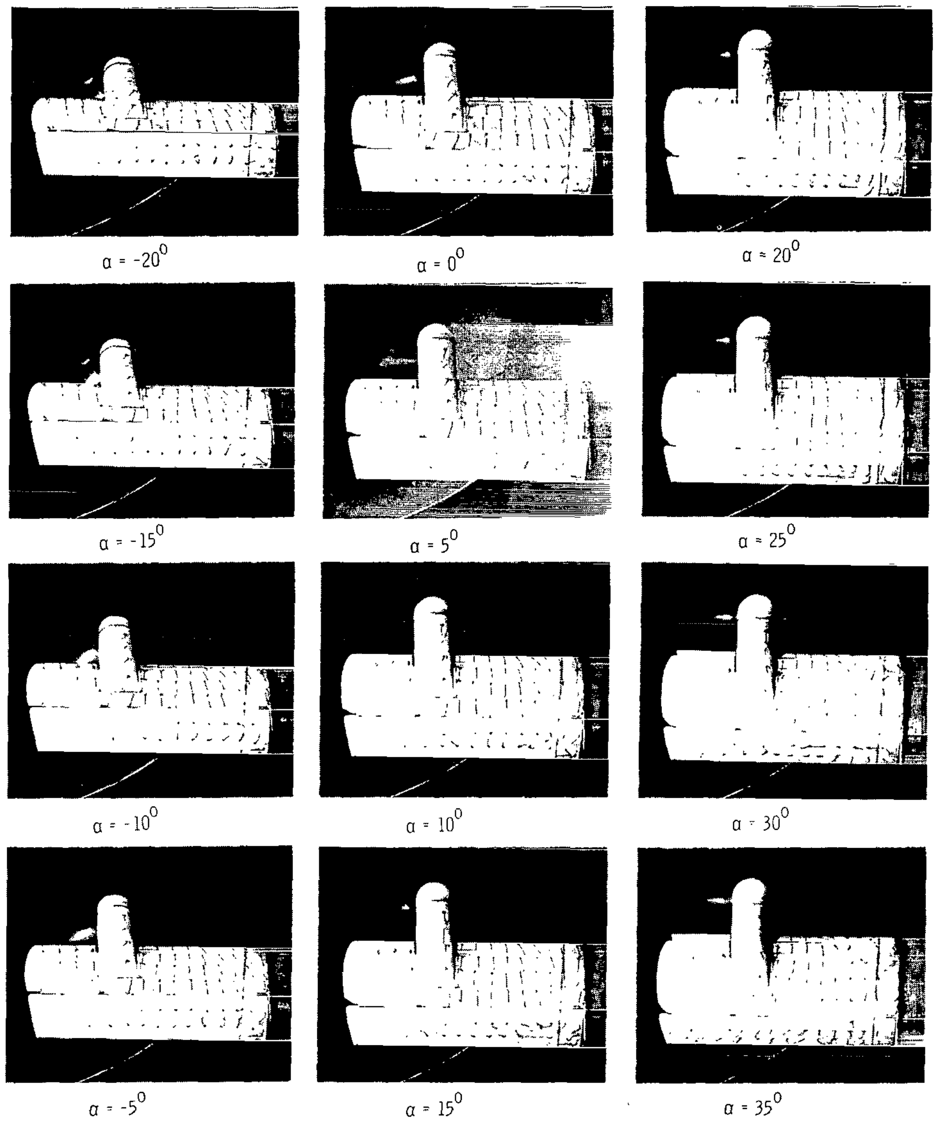
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7193

Figure 17.- Continued.



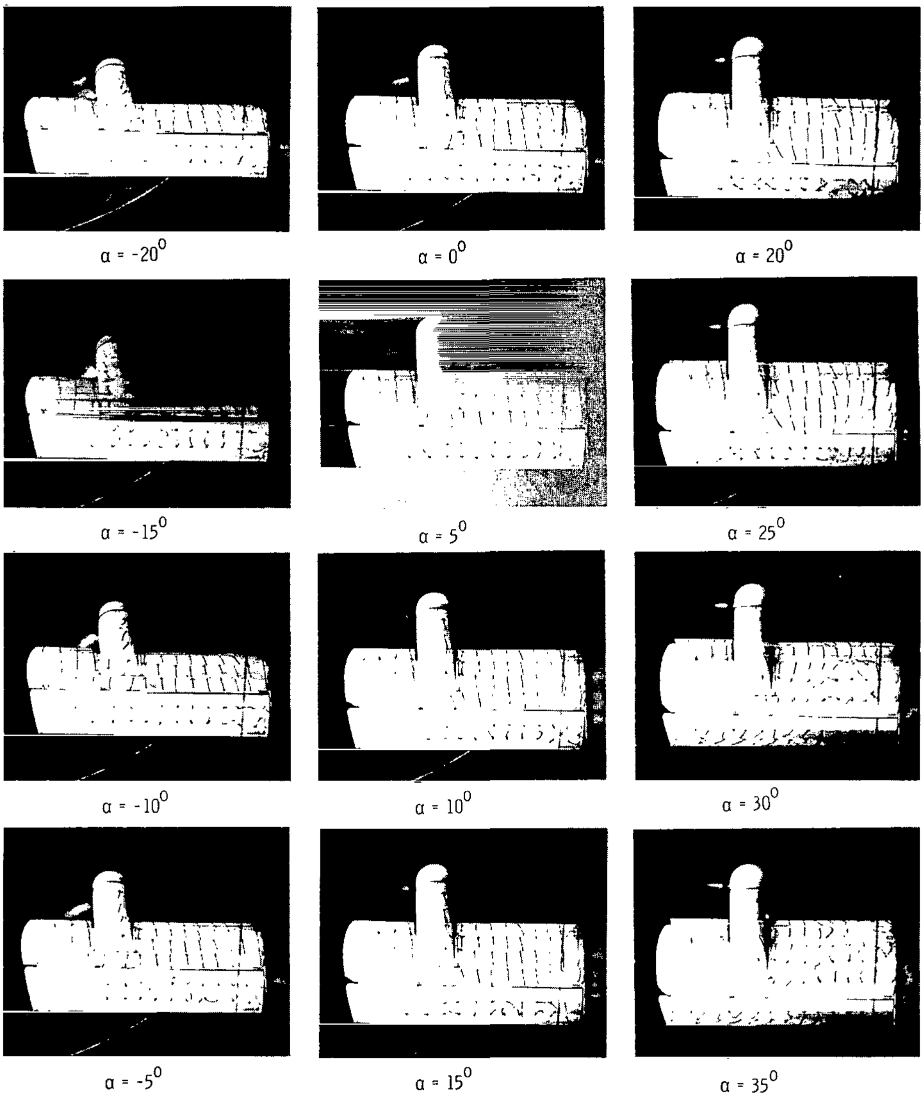
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-7194

Figure 17.- Continued.



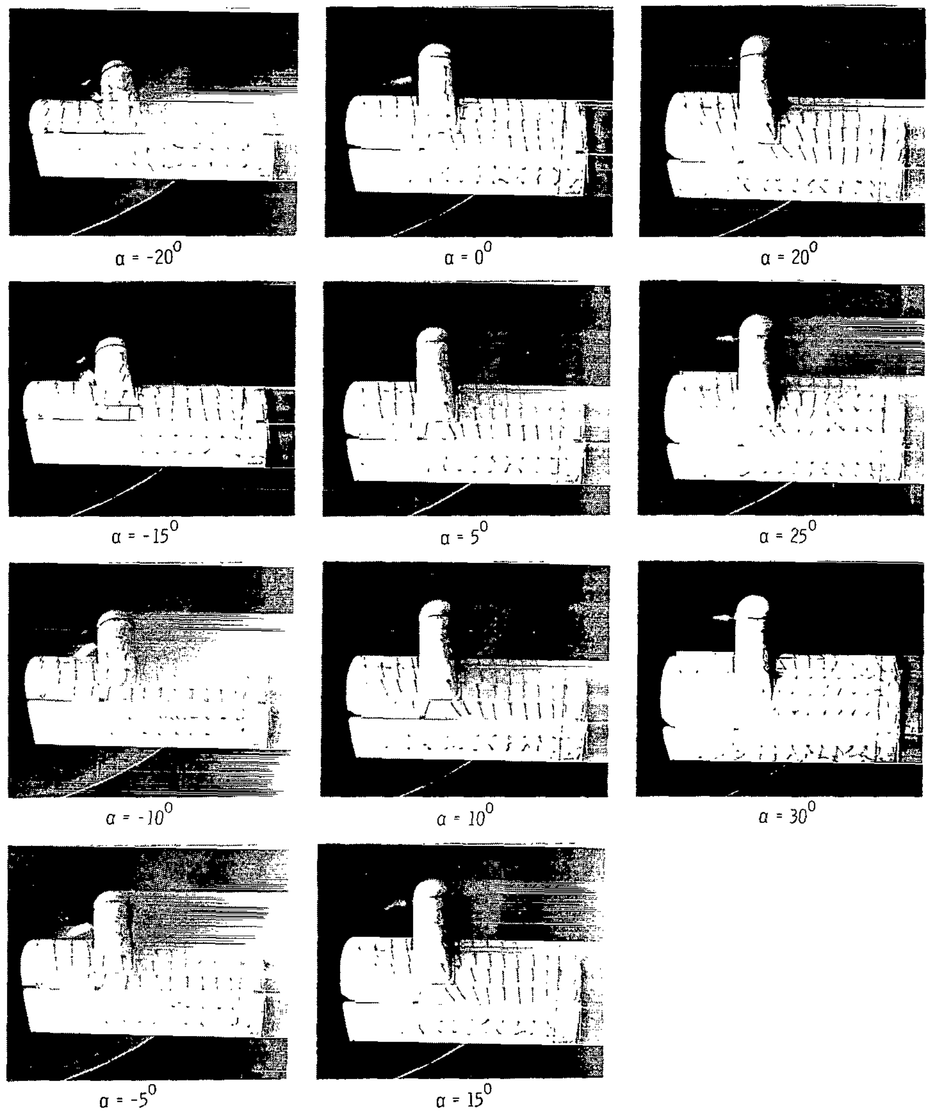
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-7195

Figure 17.- Continued.



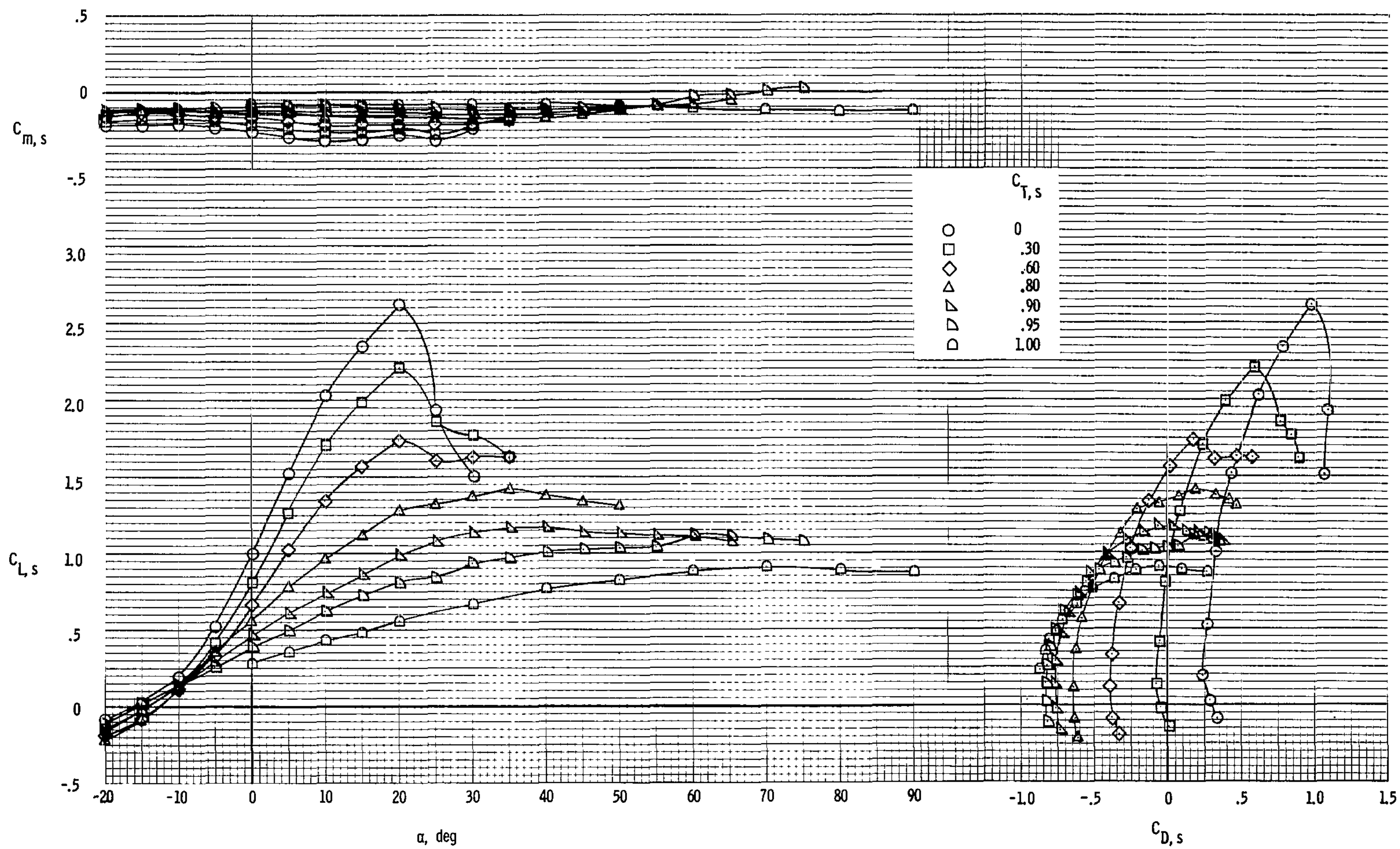
(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-7196

Figure 17.- Continued.



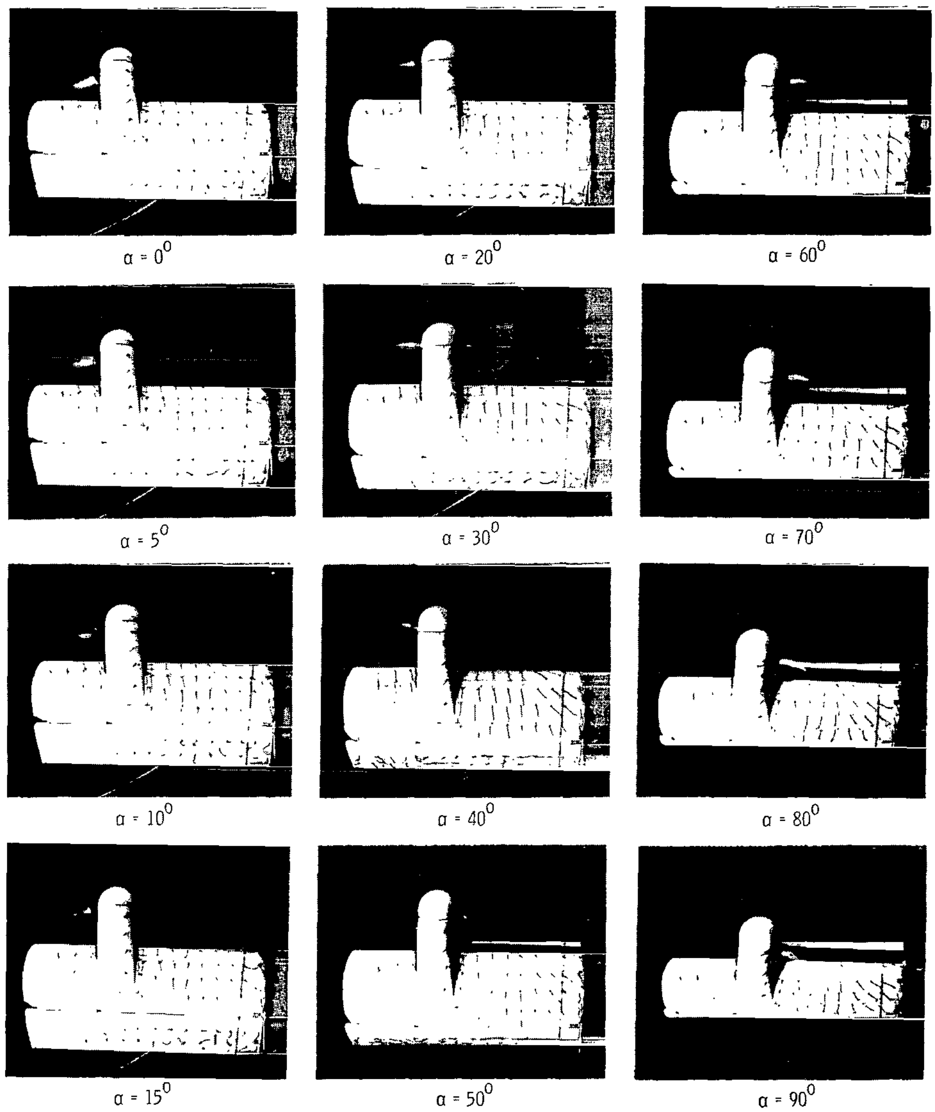
(h) Flow characteristics; $C_{T,s} = 0$. L-64-7197

Figure 17.- Concluded.



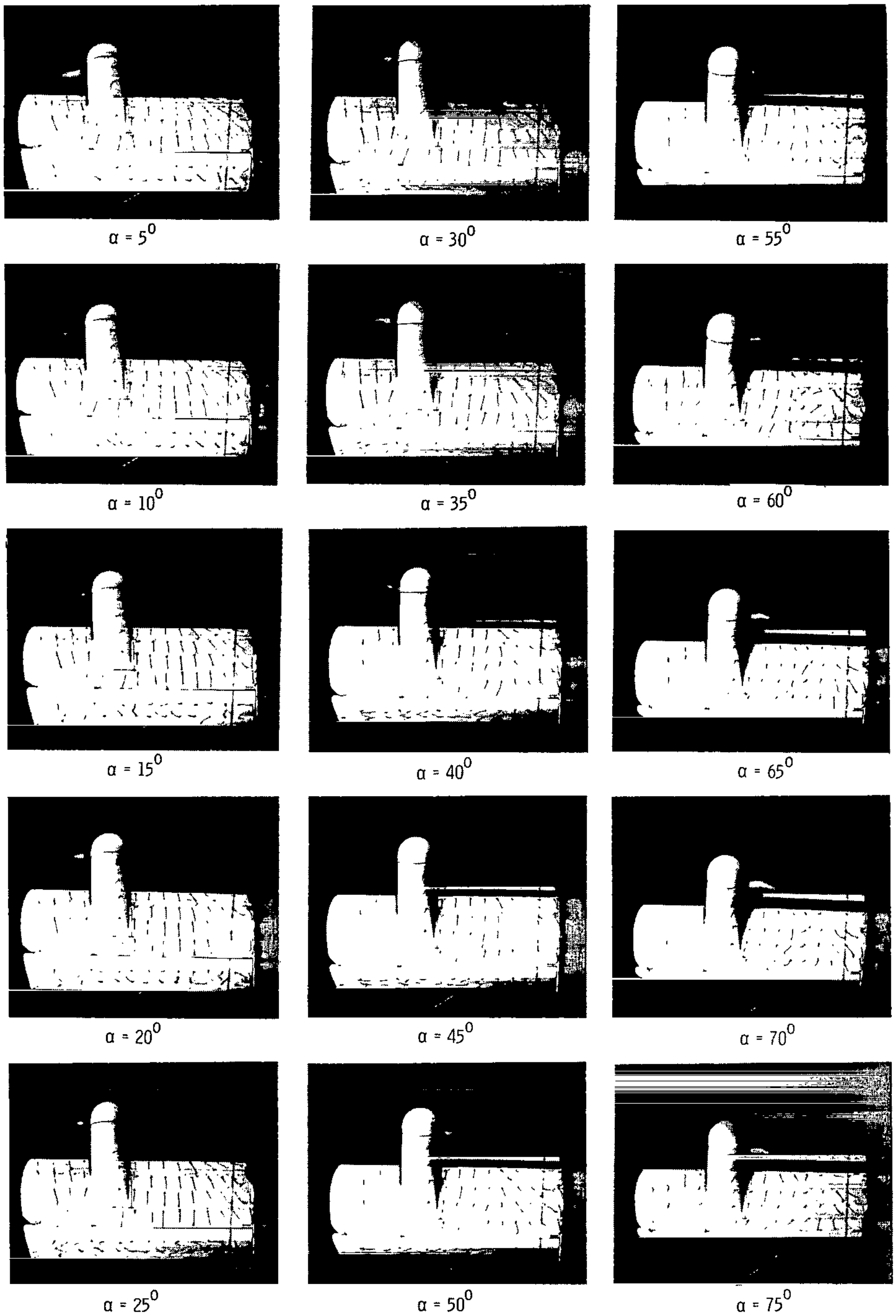
(a) Aerodynamic characteristics.

Figure 18.- Aerodynamic and flow characteristics of the model with the inboard section of the Krueger flap deflected 50° and with the Krueger faired to the nose of the airfoil and with the trailing-edge flap deflected 50°.



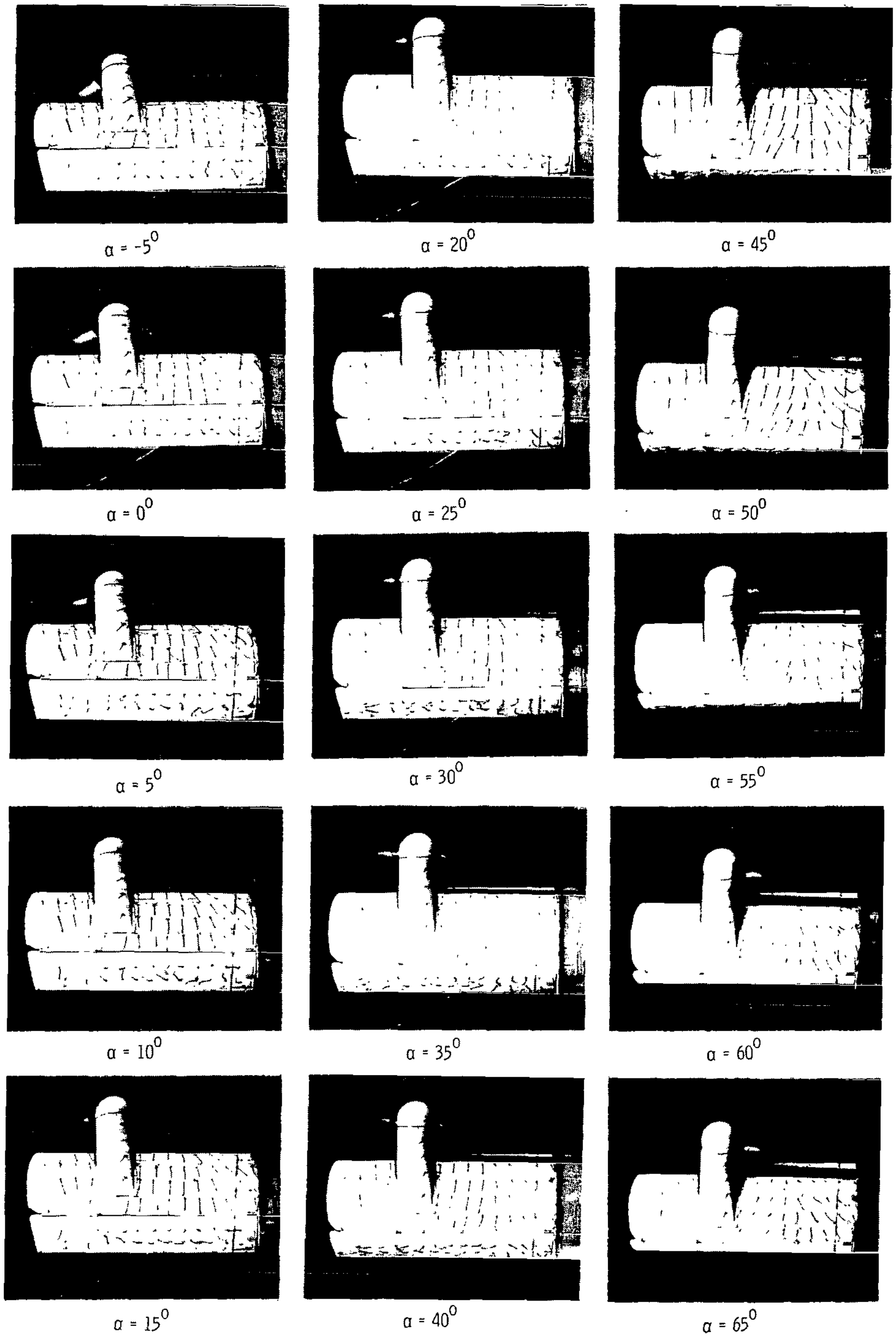
(b) Flow characteristics; $C_{T,s} = 1.00$. L-64-7198

Figure 18.- Continued.



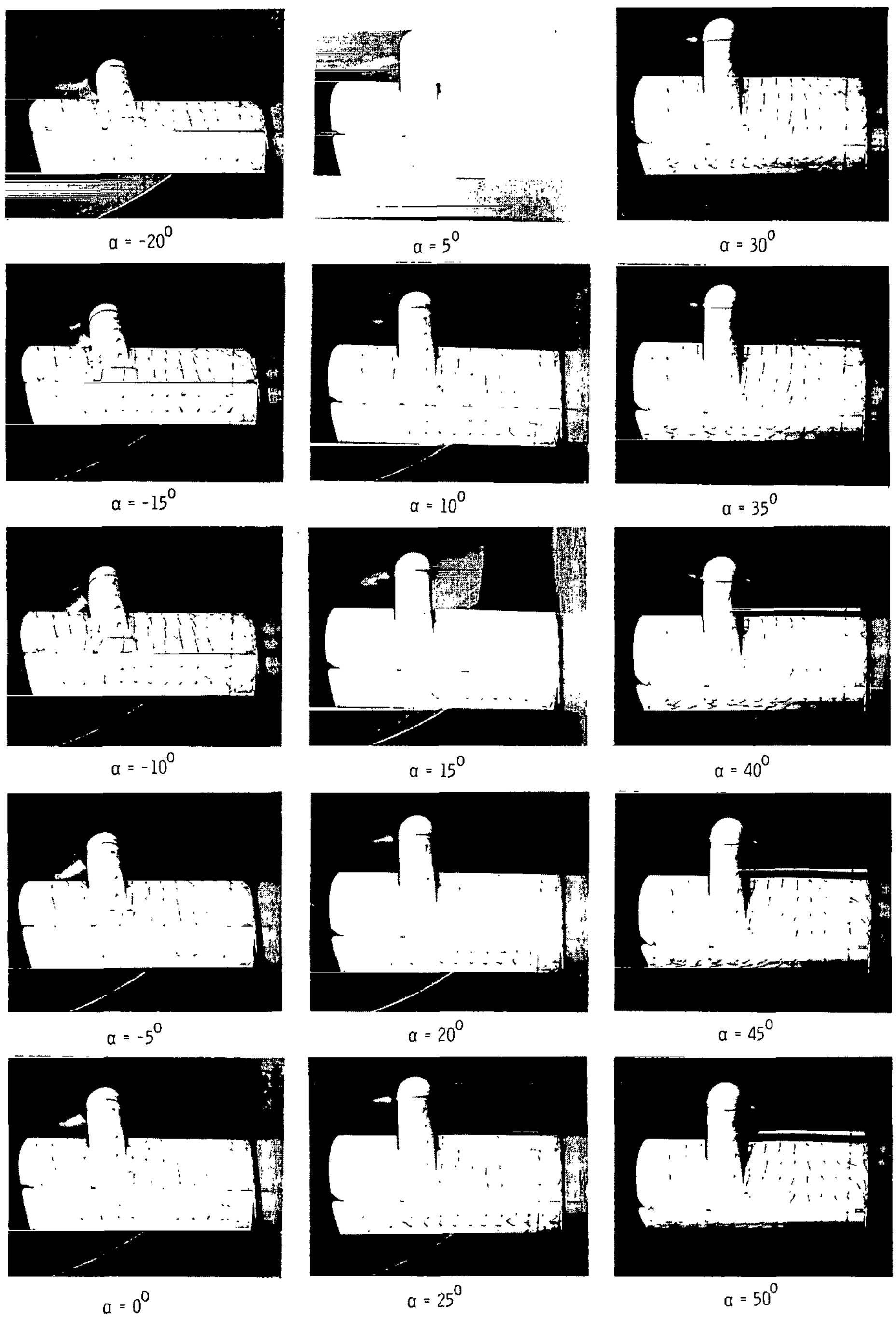
(c) Flow characteristics; $C_{T,s} = 0.95$. L-64-7199

Figure 18.- Continued.



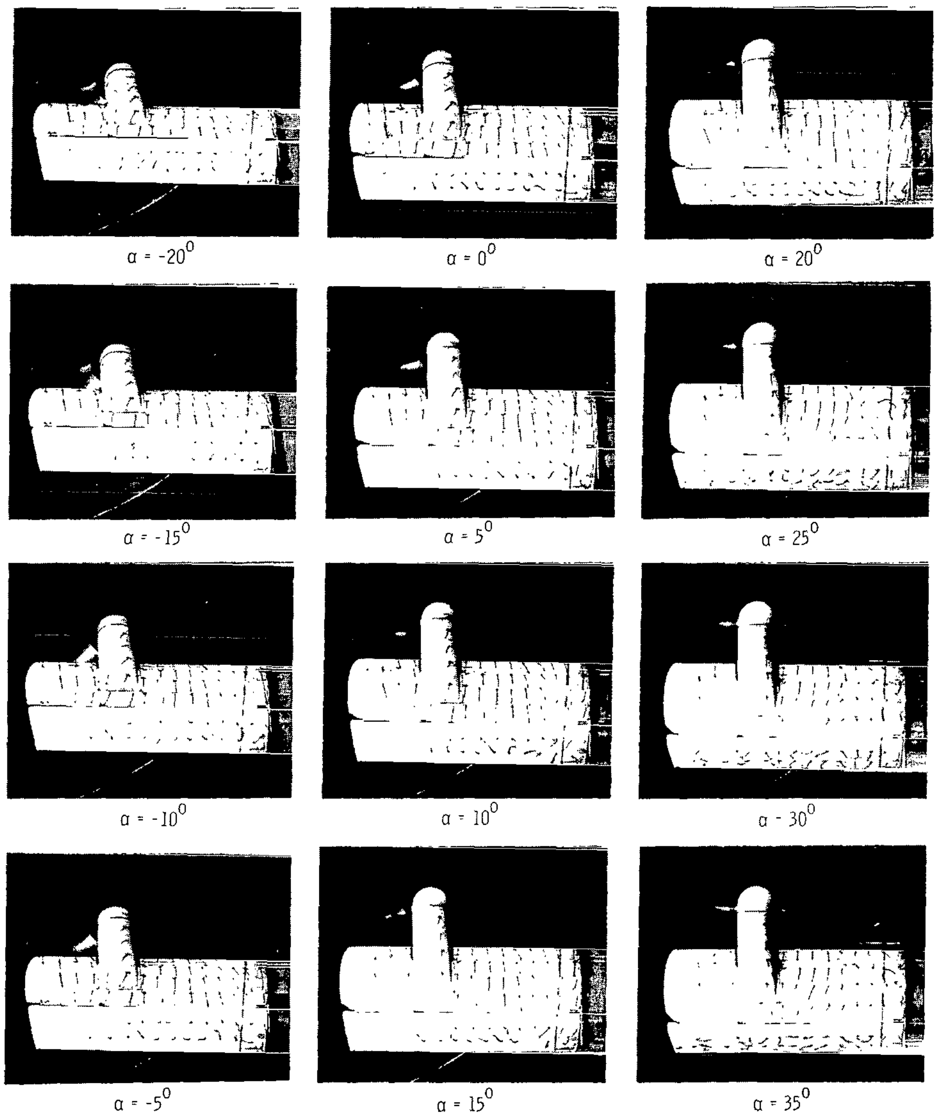
(d) Flow characteristics; $C_{T,s} = 0.90$. L-64-7200

Figure 18.- Continued.



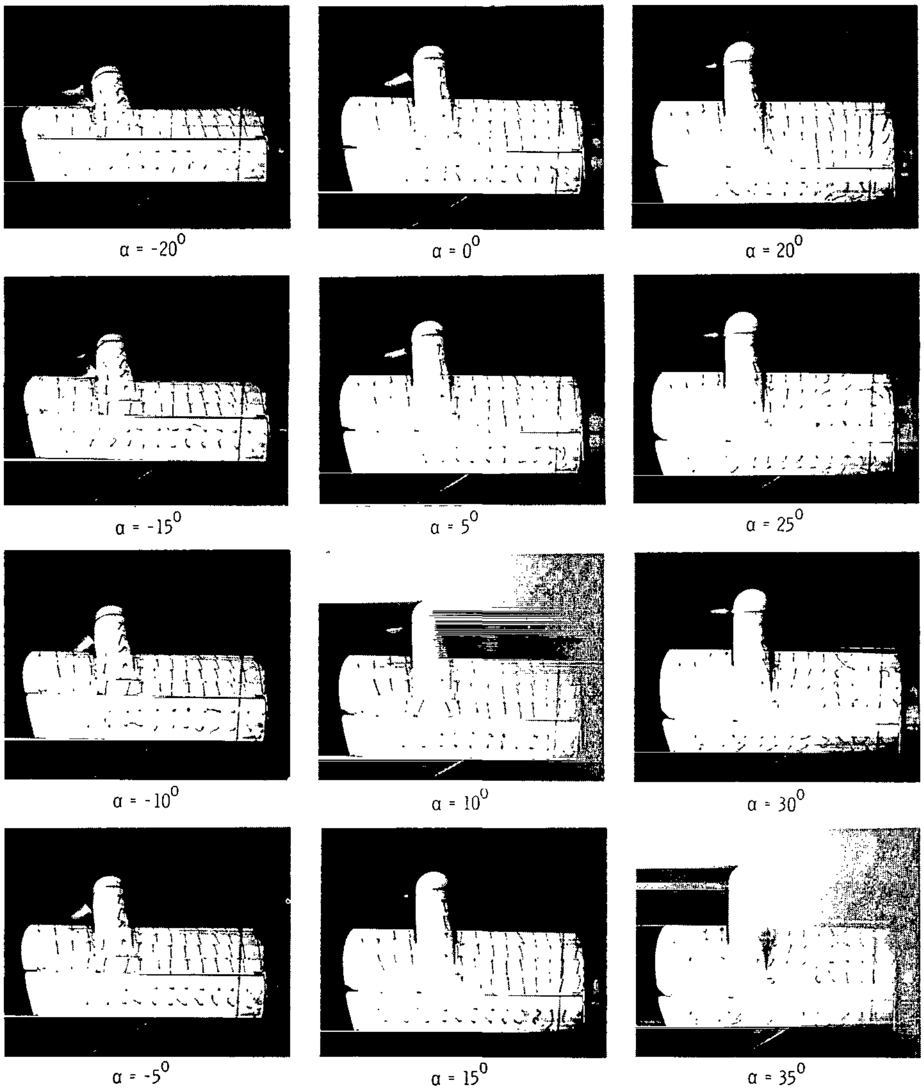
(e) Flow characteristics; $C_{T,s} = 0.80$. L-64-4734

Figure 18.- Continued.



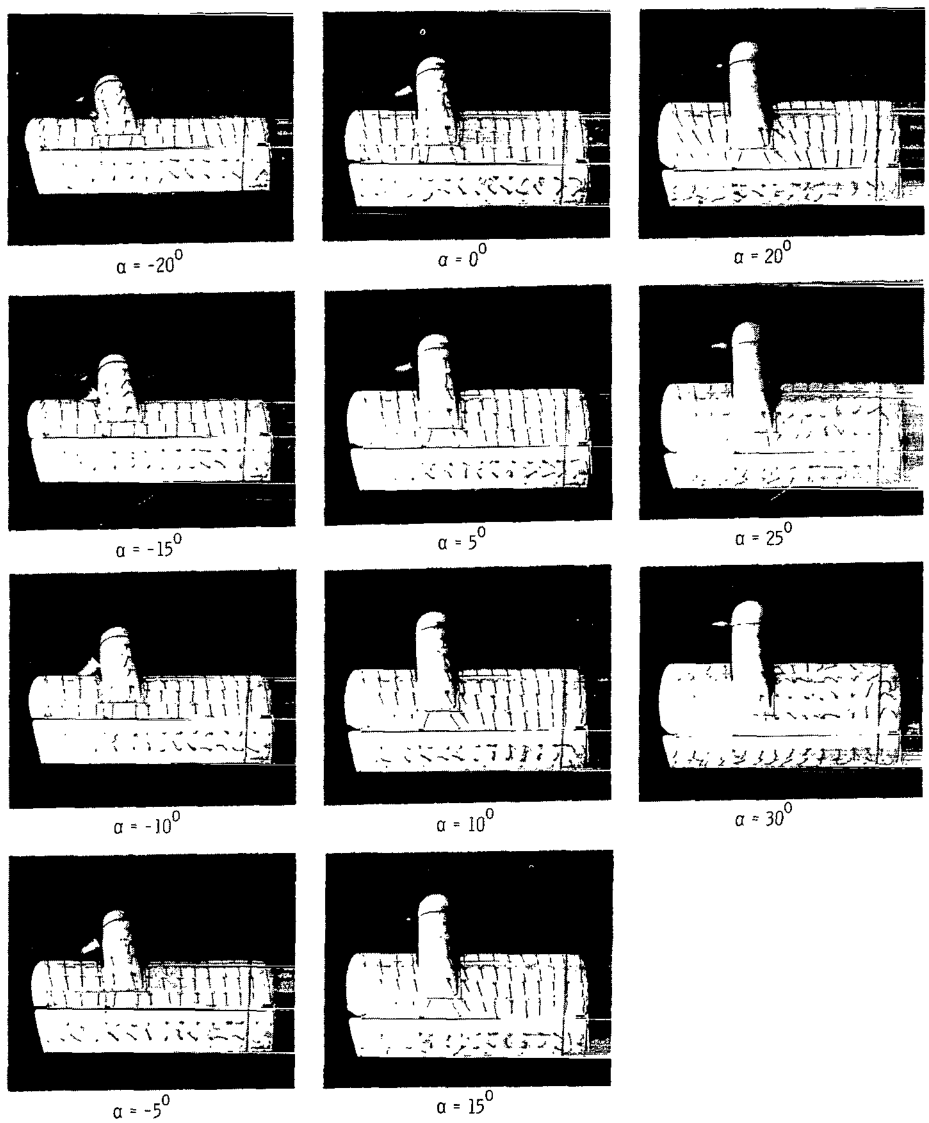
(f) Flow characteristics; $C_{T,s} = 0.60$. L-64-4735

Figure 18.- Continued.



(g) Flow characteristics; $C_{T,s} = 0.30$. L-64-4736

Figure 18.- Continued.



(h) Flow characteristics; $C_{T,s} = 0$. L-64-4737

Figure 18.- Concluded.

NASA-Langley, 1964 L-4118

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—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

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